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[OFFICIAL NOTICE.]

CENTRAL NEW YORK GAS ENGINEERS ASSOCIATION.

OFFICE OF THE GAS LIGHT COMPANY, OF SYRACUSE, SYRACUSE, N. Y., April 30, 1885.

The Sixth Annual Meeting of the Central New York Gas Engineers Association will be held in Syracuse, N. Y., on Thursday, May 21, 1885. Headquarters will be at Globe Hotel. Those intending to be present will confer a favor by notifying the Secretary on or before May 19th.

Any person interested in the manufacture of gas in central or western New York is eligible to active membership.

We cordially invite members of other Associations to be present.

H. N. BABCOCK, Secretary.

AN UNWARRANTED SLUR.

The May number of the *Electrician and Electrical Engineer* contains a rather mean slur on a most painstaking and fairminded official of New York city, and we regret that our contemporary should go so far out of its way to do an injustice toward a man who has done so much for public street lighting in this city during the past few years. In an article headed "Darkness Preferred to Light," the *Electrician*, in pursuance of its undoubted right, goes on to discuss the report submitted to the New York city Board of Aldermen, on April 24th last, by Mr. Stephen McCormick, Superintendent of Lamps and Gas, in which that gentleman furnished figures estimating the comparative cost of street lighting by gas and electricity. Our contemporary claims that Mr. McCormick's figures showing that resolutions of the Common Council "called for 2,003 additional arc lights to replace 5,345 gas lamps," are apt to convey "a very erroneous impression as to the efficiency of the electric lights;" and then makes the claim, "The records prove that they have heretofore replaced from 8 to 12 gas lamps each, according to location." Even supposing that "heretofore" (and the figures of the *Electrician* are decidedly far from being correct, as the average displacement has never exceeded 6½ gas lamps to one arc) an arc did displace "from 8 to 12 gas lamps," this in itself is no proof that the 2,003 additional arcs called for by resolutions of Council would displace a single more post than the 5,345 returned by the Superintendent. However, what we wish to call particular attention to is not that, but this: The *Electrician* then remarks, "The Superintendent goes so far as to say, 'I have not discovered any advantage which the electric light possesses that cannot be obtained from gas lighting, except the instantaneous lighting'"—putting the following slur upon the motives which impelled Mr. McCormick to make the above assertion: "If there is any job lurking in the suspicious statement of Supt. McCormick, perhaps a beam of light turned in that direction may unearth some interesting developments." Not only do we assert that this is a decidedly mean slur upon Superintendent McCormick, who has time and again, and at a period long before the *Electrician* had graced the world of technical literature with its presence, shown the honest sort of stuff that enters into his composition; but we would also submit that the *Electrician*, if it is so eager to "turn rays of light" upon "jobs," might find plenty of material worthy of illumination if it would only explain how it is that the electric lighting companies managed to induce the city to pay them 70 cents per night for each arc light maintained by them!

LUDICROUS ANTICS OF THE GAS REFORMERS.

The defeat of "Sherman, Thurber & Co.," as experienced at the hands (and votes) of the members of the New York State Assembly on the afternoon of April 30, has thrown these worthies into a most frenetic state of mind and feeling. In fact, if their bodies had been subjected to contact with the current developed from a high-power dynamo they could not by any manner of possibility have indulged in a more extensive or varied assortment of contortions than those displayed by them after receipt of information that the "forty thousand dollars per annum" commission measure had been buried beyond the hope of resurrection; and, in truth, we were inclined to pity rather than laugh at the picture they presented when the conviction was forced upon them that their "little game was up." As far as the merits of the defeated Commission bill go, we do not propose to enter into any dissection of them; but will dismiss the whole thing with the remark that the measure was abortive in every respect, and not possessed of a single feature that could recommend it to the favorable verdict of either the gas maker or the gas consumer. Mr. Sherwood may be an authority on "flats," or apartment houses; Mr. Thurber may know all about the manufacture and sale of glucose, and be equally well posted in regard to the make up and distribution of various brands of cheap cigars; Mr. Schultz is undoubtedly an expert when it comes to delving into the mysteries of the respective and comparative merits of different grades of "pebbled goat," superfine French calf," etc., leathers, and could probably tell at a glance whether a hide had been properly tanned or not; and Mr. Bottsford, beyond cavil, is accurately posted in the art of correcting printers' proof sheets. Still, possibly we may be pardoned by one and all of these gentlemen if we gently convey to them an intimation that when it comes to the question of a real knowledge of the science and practice of the manufacture of gas they know just as much about these things as does "the man in the moon."

"Fools rush in where angels fear to tread," and it does seem as though the old saying had a good deal of truth in it, more especially so when we behold the real estate speculators, wholesale grocers, leather tanners, and amateur journalists of a great city like New York boldly, and in the most off-handed manner, combining together with the avowed purpose of "regulating" a business of which they know absolutely nothing. What a rarely ludicrous thing it would be were General Roome to assume upon himself the task of telling Mr. Schultz that he was selling his leather at too high a price; or that he failed to give proper quantity according to the bargain made. Yet that in effect is what the reformers say to the General. They say the gas rates are too high, and the meters are a fraud. The JOURNAL has always been an advocate of low gas prices, and not on account of any high moral reasons either. Years of experience have taught us the pecuniary value of low rates and stability of profits arising from them. Where rates are low but little temptation is offered for the investment of new capital—in short, cheap gas throttles mere speculation, and builds a safeguard broad and high around investments honestly made in the business. If the capital of the Consolidated Company is excessive, and that all its shares do not fairly represent an actual money investment, that is only to be attributed to the foolish operations of former "reformers," whose disregard of the simplest known commercial laws enabled schemers to obtain the possession of grant after grant for the establishment of opposition works. The "reformer" predecessors of those of the present day caught the fever of regulating the gas business by the aid of competition, and so the work of piling up the capital went merrily on. But, since our readers are already well posted in these matters, it is futile to pursue them further here.

As far as the meter portion of the Sherwood wail is concerned, the very stupidity and dense ignorance of the claim should be apparent to any ordinarily intelligent mind ere the echoes of the bray had died away upon the lips of the utterer. The New York Assemblymen did credit to themselves when they refused to give assent and consent to the enaction of a measure that emanated from the addled brains of a handful of zealots, who, in the intensity of their egotism, supposed that they had but to say, and it were done. We do not say that the Sherwood clique may not in time learn something about the principles governing gas supply; but it would far better become them, and possibly entitle them to consideration, did they begin with the primer of the art instead of attempting at first to dictate the letters of which the alphabet of that art was to consist. Their trick of May 13th at Albany, in connection with the measures known as the Cullen and Coffey gas bills will avail them nothing during this session. And if they can learn by the experience gained in '85, perhaps wisdom (or at least a grain of it) may appear in their efforts at lawmaking in '86. Still, it must be unfortunately conceded that cropping the ears of a certain loud-voiced quadruped does not succeed in making that animal resemble the descendants of the Godolphin Arabian.

Before leaving this subject we cannot forbear making some mention of the mass meeting held at Masonic Temple (in this city, on night of May 6th), at the instance of the "Gas Consumers Association," the main and the avowed object of the conclave being to signify how deeply and badly the "Association" was suffering on account of internal wounds received at the hands of New York State's lawmakers on the afternoon of April 30th. President Sherwood and Secretary Gardner had conceived the brilliant idea that the proceeding at Masonic Hall would be enhanced did they make it assume, in its preliminary shape, somewhat of the aspect of a funeral; consequently thousands of handbills, surrounded with a deep black border, were scattered broadcast through the city. These handbills bore the heading, "The fight for honest gas!" like as though any one had ever heard of dishonest gas; and they were also strangely silent on the subject as to what sort of crime the gas had committed; and stranger yet the whole discussion on the night of the 6th appeared to hinge closely upon the honesty, or reverse, of the Albany Assemblymen. The "getters up" of the meeting, in so far as they counted upon having a funereal assemblage were pretty nearly correct. The hall was about half occupied, and the "fight for honest gas" was waged to empty benches. It needs no repetition here of what was done to make the proceedings recognizable to our readers. Sherwood, Schultz, *et al*, were there in full force, and "whereases" and "resolves" were indulged in to an unlimited extent. From some of the statements made there we find it was gravely asserted that—"Pressure was brought to bear on some of the country members by local gas companies. The assistance of these instruments was invoked by and through the American Gas Light Association—an organization of gas companies apparently for both offensive and defensive purposes. It professed to see in this bill an entering wedge of widening legislation." Can anything equal to this for downright stupid mendacity be presented? We reprint this statement as it appeared in the columns of the *Tribune* (giving detailed report of the Masonic Temple proceedings), of date of May 7th. We have not observed any contradiction of it subsequently made by the "reformers," and we are obliged to believe that they so put themselves on record. With the above example we may take our leave of the "reformers," pure and simple, and, by way of closing out the subject, note that it would seem more rational did that Harlem preacher—he who holds forth at the Unitarian Church, 128th street in this city, and who spoke last Sunday to the topic of "Honest Gas"—forsake the pulpit for the trapeze. He would give less scandal in the latter situation.

A CHANGE AT LOUISVILLE, KENTUCKY.

It has not been generally known to the fraternity that Mr. J. H. Baxter, formerly President of the Louisville (Ky.) Gas Light Company, had succumbed to the attacks of the grim reaper. His death occurred on the 30th day of last March. At the meeting of directors subsequently held to fill the vacancy thus created a unanimous vote of the board resulted in the elevation of the Hon. Geo. W. Morris to the presidential chair. Mr. Morris has been a director in the company for several years, and is well qualified for his new position by an abundance of business tact gained through an intimate connection with various business enterprises. His suavity and tact will be of valuable assistance to the Louisville Company in its present battle with the mongrel combination of usurpers now operating there under the title of the Citizens Gas Light Company. Even with gas rates at $1 per 1,000, the old company is managing to accumulate a surplus, and Mr. Carley, despite the frantic appeals and comic posturings of his "man, Fitch," may yet have occasion to regret the hour in which he listened to the syren-like blandishments of the U. G. Imp. Co.

The Market for Gas Securities.

In our quotations for gas securities in last issue Consolidated of New York city was reported at 90 bid, offered at 91. As was naturally to be expected the defeat of the high-priced commission scheme by the Assembly of New York State had the effect of stiffening prices, and the brokers were kept busy in supplying stock to parties seeking sound investment parchment. During the fortnight about 10,000 shares changed hands between the figures of 93 and 96¼, the latter quotation representing latest transaction heard of by us up to time of writing (noon of May 14), at which notch 100 shares were sold. There is every likelihood that Consolidated will go to par before "Decoration Day" of 1885. It is pretty well authenticated that a dividend of three per cent. will shortly be declared. The feature of the city market, though, is the upward movement in Equitable, which we now quote at 124 to 126. Mutual is higher at 130 to 132. In regard to Equitable it may just possibly be the case that the "insiders" are manipulating the shares in order to gain the confidence of investors with respect to the placing of the stock of their new scheme at Baltimore, Md. Be this so or not, we would advise "outsiders" to part with their New York Equitable holdings at the present (or even a trifle below it) market figure. Brooklyn stocks are steady to strong.

In out-of-town shares it is understood that the Philadelphia Philanthropists are endeavoring to obtain control of the old St. Louis (Mo.) Gas Light Company. Should they eventually succeed it will cost them a neat sum, as $800 is bid on each par value of one hundred dollars. Laclede, of St. Louis, is looking up; Jersey City (N. J.) is strong; and the same may be said of Louisville, Ky., and Washington, D. C. For regular list, see page 166.

[A despatch from Chicago (May 15), says that Pres. Lackland of St. Louis Company refuses to continue negotiations with the Philadelphia speculators.]

[Official Report—Concluded from Page 230.]

Fifteenth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Mass., Feb. 18 and 19, 1885.

Second Day—Morning Session—Feb. 19.

Conclusion of Question-Box Discussion.

The next question taken from the box was the following:

"What is the cause of the clogging up of burner tips in houses that are situated at the dead ends of mains; and what is the remedy?"

The President—Col. Stedman, have you any "dead ends" on the Newport gas mains?

Mr. Stedman—We have a few places or locations where trouble has arisen from stoppages caused by an accumulation of fine particles in the burner, the effect of which would be to destroy the structure of the flame; but we have always had the greatest trouble of that sort when we have put in an extension to a main (to supply a new district) which terminated in a "dead end." For a year or two after the main was laid we would have the stoppages. We changed from batswing to fishtail burners, in order to overcome the difficulty. We have sometimes used large burners, packing up their interiors with cotton or wool for the purpose of arresting the passing particles. We have found that the fishtail burner is less likely to become obstructed than the batswing burner. In a few particularly bad cases we were obliged to change all the burners in a number of houses (substituting fishtail for batswing) in order to overcome the stoppages constantly occurring when the batswing burner was in use.

The President—Did you find that there was more of this trouble experienced near the "dead ends" of mains than in ordinary locations on mains?

Mr. Stedman—Yes, sir. We attributed the trouble to the new iron, believing that a great number of minute particles from the newly made castings were loosened and swept along with the gas. I know that the stoppage trouble would abate in the course of a year or two from the time the new pipe was put down. In one case, where we laid from 700 to 800 feet of 4-inch pipe, stoppages occurred during a period lasting about three years. At the termination of third year the trouble ceased, and we have had no more complaints from that point, in spite of the fact that we have not extended the main any further. In still other cases where we have extended our mains, and had obtained quite a number of consumers on the new extension, we experienced, for a short time, trouble with them all. When relief was once secured the stoppages never recurred. I would not ascribe these stoppages to the fact of the creation of a dead end on a main, but, as said before, I adhere to the belief that they are occasioned by the detaching of minute particles from the interior of the newly made iron.

The President—Have you ever had any trouble with new mains which did not terminate in dead ends?

Mr. Stedman—No; I do not think we ever did. I remember one time when we put in a 12-inch main to replace an old 3-inch one (at about the center of the town), and I do not recollect that we had any difficulty at all. In the particular case spoken of above (the new district with the supply main thereof ending "dead") the location of the pipe was between 2½ to 3 miles distant from the works, and the work was done at different periods—say at three or four intervals, and laying between 300 and 400 feet at a time—occupying perhaps three years for its entire completion. Now, each time that main was extended the stoppages would occur in the burners supplied from the new pipe, the difficulty entirely disappearing after the lapse of a year or two—indeed, seemingly being determined by the greater or lesser number of services that would be tapped into it. It seemed to take just about so much gas to clean up the particles, no matter whether that amount was used in six months or in one or two years. I do not know why we should not have the same difficulty when we put in a new main through the center of the city; but I have never heard any complaints from consumers so located. Possibly the particles were swept along out of the range of the consumers on that line, and thus distributed among so large a number of consumers as not to exert any appreciable effect in any particular case.

Mr. Harbison—We have very few dead ends in our system of mains at Hartford; but, as against Mr. Stedman's theory of the difficulty only occurring where new mains were laid terminating in dead ends, I can say that one year ago last fall we laid about 8,000 feet of new pipe in order to reach one consumer. The parties used the batswing burner all through their building; and they have had no difficulty during the fifteen months they have been using the gas supplied. We have another line, nearly a mile in length, laid three years ago, to reach one house, and we have had no difficulty at all. With these examples, I think the difficulty cannot be caused by "particles sweeping along the main."

Mr. Yorke—In case of such stoppages I would be apt to recommend that the parties purify their gas a little better; and mentioning this, I might relate an experience gained several years ago, and which served as a good lesson to me. Being absent from my works at one period for over a week, when I returned I dropped into the company's office. While there a consumer came in and inquired from the clerk why the gas smelled so bad; or rather said there was a bad smell in his premises, and that he had attributed it to the gas. It occurred to me that perhaps the gas had been allowed to get foul. I went right up to the works, tested the gas, and found it to be foul in both holders. The ammonia was up to 40 or 50 grains. Shortly after that complaints of clogged burners came in from all sections of the town, and of course the clogging up must have been due to the foul gas sent out. It took a week to end the trouble.

Mr. Nettleton—I am glad this question has been asked, for during the last winter I have been exceedingly annoyed in that way in my own house. I live at the end of a long line of pipe laid last fall, and on which there are very few consumers. At first I used lava-tipped batswing burners, but was annoyed at once by the burners stopping. I changed the tips frequently, but it did no good. Finally I put on brass fishtail burners; and since then I have had very little trouble. There is certainly some cause for these stoppages.

Mr. Harbison—What kind of burners did you put on?

Mr. Nettleton—Principally brass-tipped fishtail burners, and a few of the Bray fishtail description. I think the difficulty must be attributed to something besides the new mains, because I have had the same experience as that recounted by Col. Stedman—laying new mains through the center of the town, when very few burners were stopped.

Mr. Stedman—Our experience of noticeable trouble in that direction has been so uniformly coincident with the laying of new mains at a distance from our works, or where they would form dead ends, that we have been forced to the conclusion that there was something in the new mains that caused the difficulty. As to the matter of purification, we rather pride ourselves that we get most of the impurities out. We always have our ammonia below five grains, and we always keep one clean purifier through which the gas is going. We test the third purifier, and have one entirely clean box. I was in a town once where no pretence was made of taking out the ammonia, but where they *did* change the purifiers once in a while—doing so, nevertheless, without any regard to their fouling; and the purifiers were at all times so hot that you could not bear your hand on the first one, the station meter itself being so warm that you did not want to keep your hand there a great while. The gas went through with pretty much all of the original impurities left in it; and where that gas would burn *at all* they did not have the least difficulty with stoppages of the burners. I know of one large mill that used the gas, and the only difficulty the mill owners had with it was that they were compelled occasionally to shut down the mill and dismiss their operatives because the air got so contaminated with sulphur that they could not breathe it.

Mr. Snow—At Holyoke during the last four years we have laid about six miles of new pipe, some of it in the heart of the city and part of it in the suburbs. With the central portion we have had no trouble at all, and stoppages are only to be found in burners located on and near dead-end mains. Last fall, in order to reach two consumers, we laid 3,800 feet of pipe. The consumers had such continual trouble (the buildings supplied were private residences) that they were obliged to replace the burners every few nights.

Mr. Stedman—I think Mr. Snow will find a remedy by using brass-tipped fishtail burners—the Bray description, for instance.

Mr. Snow—I am glad to hear that. If the brass tips have not been tried I will recommend the substitution at once.

Mr. Learned—We had this same trouble at Newton Center, and conquered the difficulty by putting on the Bray fishtail burner.

The President—This discussion has shown the value of the question-box. Here is a matter that has bothered many people; Mr. Snow has got something out of this discussion, and perhaps Mr. Nettleton may also get something out of it. It is a practical question, such as we want to hear discussed here.

Mr. Snow—There is yet another point I will mention. The house of a consumer is close to a dead end, and the location is on high ground. The burners kept clogging up, and we were inclined to believe that the stoppages were caused by the high pressure. We put on a governor to bring the pressure down to about one inch; the stoppages then ceased. Whether that plan would work in every case or not is a question to be determined.

Mr. Stedman—In the particular locality referred to by me there was no excess of pressure.

Mr. Wood—Just at this point I would like to say that we have had a great deal of trouble at Syracuse this winter from the clogging up of consumers' burners in different parts of the city. It cannot be attributed to new pipes, because the stoppages have been quite as bad on the old pipes as on the new. We have done what we could to see that our gas was thoroughly purified; it has gone out clean, free from sulphur or ammonia. I am inclined to ascribe the trouble as a consequence of the extreme cold weather experienced this winter.

The President—I think everybody has had some trouble with burner stoppages this winter; and I believe Mr. Wood's theory quite nearly accounts for the vexation.

The President—The next question is—

"What is the best coke crusher?"

I think Mr. Slater crushes his coke, and can probably answer the question.

Mr. Slater—We borrowed the idea from Mr. Stedman.

The President—What style of crusher does Mr. Stedman employ?

Mr. Stedman—The crusher we use is a simple device gotten up something after the suggestion of the "picker" in an ordinary cotton mill. Imagine a series of stationary teeth set in the bottom of a box, and between these revolve the teeth placed on a spindle or shaft which makes about 300 revolutions per minute. The teeth, revolving with a good deal of speed, strike the coke with considerable force; and we think the result is that the coke is cracked rather than crushed. We thus get the minimum of dust and small particles as a consequence of coke breaking. Of course, a machine like the one I have attempted to describe can be made to crush any amount of coke in a given time. It is simply a question of the size of the box, the number of teeth, and the power necessary to run it. At our place we can crush about 100 bushels per hour; but we have no occasion to crush that quantity. We generally crush about 90 per cent. of the coke which we sell, since it is all taken for domestic use. The last mill to be operated in our city was recently closed out under the "hammer," and at the present time we have no manufacturing establishments at all. As a consequence, our sales of coke are restricted to the requirements of domestic use; and we are obliged to prepare our coke so that our customers can use it conveniently in their stoves.

Mr. Yorke—Is your crusher run by power?

Mr. Stedman—Yes; and in handling a quantity of coke there may be a good many economies introduced—such as raising it into the crusher without the intervention of hand labor.

The President—Does the crusher break the coke to the same size, whether it runs fast or slow?

Mr. Stedman—We run at a uniform speed, and have never tried to vary it. I think it would be apt to break the coke into larger pieces if run slower. Each piece is now struck a blow so violent that it almost knocks it out of the machine into the screen.

The President—Is there a patent on your machinery?

Mr. Stedman—No.

The President—Has any other gentleman any information to volunteer on the subject of crushers?

Mr. Leach—I do not see Mr. Cushing in the room; but I recently understood him to say that in trying a coke crusher he found that he could do the work very much faster by hand. I do not know how he managed it, but that is the remark he made.

Mr. Stedman—It would depend upon the number of hands employed.

Mr. Leach—But he said that, with the same amount of help, manually he could break coke faster than he could by machinery.

Mr. Stedman—When we first put our crusher in we sold but a very small percentage of our coke in the broken state; but the demand has gradually increased, until now we find it necessary, in order to make speedy sales of coke, to crush nearly the whole of it. If we were to fit up anything new we should handle our coke entirely by machinery—that is, we should elevate it (after wetting) into a hopper, from which it could be fed directly into the crusher; be carried from that onto the screen, and then be dumped into bins sorted out and ready for sale, without having been once touched by the hand. I am confident that no one could begin to crush coke so economically by hand as he could by a proper system of machinery. As at present arranged, we wheel our coke in barrows, and dump it into the machine entirely by hand; and of course that system is not very economical. There is no question about the economy of using machinery, because one man, provided he had the machinery necessary to elevate the coke, could break more coke in one hour than could be done by six men by hand in a day.

Mr. Leach—I was very much surprised at the remark of Mr. Cushing, as I had seen the Stedman coke crusher at work, and had become impressed with the idea that it represented a great advance over hand practice.

Mr. Sherman—I think Mr. Nettleton can give us some information on that subject.

Mr. Nettleton—I use the Stedman crusher. I have never tried coke breaking by hand, as I have always considered it cheaper to break by power.

Mr. Howe—I would like to ask Mr. Stedman if he could give us figures so that we may tell about how great the expense of crushing is? That is the test of the whole thing.

Mr. Stedman—Our net returns average about 6½ cents per bushel from the coke when we sell it for eight cents. That would be 1½ cents per bushel for the entire expense of handling the coke, including the loss by breaking. Of course, it would be as cheap for us to sell the coarse coke in the first place at 6½ cents as it would be to sell it at eight cents when crushed. We reckon the loss in bulk at 10 per cent. I find that our figures warrant us in carrying about that percentage. In other words, if you take 40 bushels of coarse coke it nets you 36 bushels broken coke. We do get some breeze which we use in our lime kiln; but we do not reckon that at all. By reason of its being broken into stove size it measures more compactly, and we get more weight per bushel.

Mr. Slater—Has Mr. Stedman in mind the figures of the comparative weights, by chaldron, of coke before and after it is crushed?

Mr. Stedman—I have not that in mind now.

Mr. Slater—Our experience is that the average weight of a chaldron of coarse coke, as it comes from the retort house, and as we sell it, is 1,600 pounds to the 36 bushels, and that a chaldron of broken coke, or just as we sell it, would weigh from 1,900 to 2,000 pounds.

Mr. Stedman—It must have a good deal of water in it.

Mr. Slater—We have had, and for several months at a time, every load of coke that went out of the yard weighed, and a record of the weight kept. From it I find that the average weight was about 1,600 pounds.

Mr. Lamson—Thirty-six bushels of coke, in the quantity that we handle, will average from 1,800 to 2,000 pounds. We now sell our coke by the ton of 2,000 pounds.

Mr. Stedman—Then the gentlemen who get 42 bushels of coke from a ton of coal must obtain a pretty good return in weight.

The President—Probably dry coke will not weigh that.

Mr. Stedman—There must be an enormous quantity of water in it; for ordinarily I think I sell from 1,450 to 1,500 pounds of dry coke to the chaldron.

The President—You are saving of water at Newport.

Mr. Slater—I beg pardon for bringing up that subject. Indeed I had no idea that I would again bring up the old coke question.

The President—We have not time to-day to discuss the question of what a bushel of coke is. We have other questions here, one of which is—

"Will gas at a temperature of 100° give the same pressure on a gauge as it would at 50°?"

What do you say, Mr. Prichard?

Mr. Prichard—Yes.

The President—No one contradicting that answer, the question is answered in the affirmative. The next question is—

"What remedy is there for tar in gas after leaving the holder?"

Mr. Stiness—It should not be there.

Mr. Slater—There is no remedy.

Mr. Harbison—Pump it out.

The President—The matter seems to excite the smiles of the members; but the gentleman who asked the question probably does not see the joke.

Mr. Cabot—Perhaps Mr. Yorke's remedy for stopped burners might apply here: Purify the gas better in the first place. I do not know of any better answer to that question than that conveyed by Mr. Harbison's suggestion to pump it out of the drips.

The President—Still another question is—

"What percentage will gas shrink in bulk if the temperature is reduced thirty degrees, or from 70° to 40°?"

Mr. Stedman—According to the rule which has been laid down, gases expand 1-480th of their bulk for each degree of temperature. For 30 degrees this would give one-sixteenth of the entire bulk.

The President—Because the temperature sinks 30° it does not follow that all the gas in the gasholder would respond to an equal fall. Sixty thousand feet of gas shrinkage out of a million would be considerable.

Mr. Yorke—My experience is that the bulk is decreased to the extent of one-quarter of one per cent. for each degree. I do not know what ratio of expansion would follow as a consequence of a great rise in temperature.

The President—It would then be about seven per cent., instead of six.

Mr. Yorke—I tried that experiment several years ago. During cloudy weather the sun, acting on one side of the holder, would make quite a difference. I made the experiments always in cloudy weather, taking the temperature of the atmosphere at an early hour of the morning, and again in the heat of the day. With one holder that we had not used for several months I tried the experiment several times; and the best result that I could get was about a quarter of one per cent.

The President—It is a fact that the large uncovered gasholder maintained by us just across the line at Roxbury expands so much from the heat that, during warm weather, we never dare to put it up full, because it expands so rapidly, when the sun comes out at the middle of day, as to put it up over two feet. That holder has a capacity of one and a-quarter millions; but if we had 900,000 cubic feet stored, and the temperature should rise rapidly, as is often the case when murky or rainy mornings clear up towards noon

with bright sunshine, it would go up with a rise equivalent to that caused by the addition of 100,000 feet.

Mr. Spaulding—I find that our men very often charge according to the holder. At our works the holder is uncovered; and we go pretty much according to the weather. On a warm day we cannot charge near as heavily as we can on a cool day.

Mr. Prichard—In addition to the expansion of the gas there will be watery vapor deposited. Gas at 60° will contain more watery vapor than it will at 30°. The difference is quite appreciable. There is also a certain amount of illuminants deposited on a cold day, which are taken up again in warm weather (as everyone knows) in an uncovered holder.

FIXING COMPENSATION OF SECRETARY AND TREASURER.

Mr. Neal moved that salary of Secretary and Treasurer be fixed at $50 per year, that sum to cover his personal expenses while in attendance at the meetings. Mr. Neal regretted that the funds of Association would not allow the sum of $100 to be set apart, and asserted that $50 was insufficient. During the 14 years that he (Mr. Neal) had held the position his expenses had invariably exceeded by $15 or $20 the sum allotted by Association. For the last few years $25 was the amount set apart, and that was altogether too meager. Mr. Stiness seconded the motion, and the members ratified the resolution by unanimous vote.

TO MANAGE ARRANGEMENTS FOR SEMI-ANNUAL MEETING.

On motion of Mr. Neal, the Board of Directors were authorized to make all necessary arrangements for semi-annual meeting of Association to be held on a date in August next.

FINAL ADJOURNMENT.

Shortly before adjournment the Chairman read a letter from Mr. H. H. Sheldon, in which that gentleman invited the Association to visit several places where his new attachment for burning gas in ordinary coal stoves could be seen in operation. This device has since been widely advertised as the "Vice-Versa" Range.

On motion of Mr. Stiness, Chairman Greenough declared the business sessions of 1885 had terminated.

[OFFICIAL REPORT.—Continued from page 235.]

Papers Read before the First Annual Meeting of the Ohio Gas Light Association, with Discussions on Same.

FIRST DAY.—AFTERNOON SESSION.

The President announced that no paper having been received bearing on "Subject No. 7," the title of same being—

"WHAT PLAN OR SYSTEM IS THE BEST FOR DISCOVERING LEAKS ON LINES OF GAS MAINS; AND WHAT IS THE BEST JOINT FOR GAS MAINS?"

he thought that, as the questions were of great practical importance, it would be a good idea to hold a verbal discussion on the topics included in "Subject No. 7." The members coincided with the suggestion advanced, and thereupon ensued the following

Discussion.

Mr. Huntington—For years the Columbus Gas Company used lead joints exclusively, and a result of the policy was the gas gradually honeycombed the lead to such an extent that the joints leaked. This experience led the company to adopt the cement joint, and its use has been adhered to. Many originally opposed the cement joint because it would not yield; on the other hand, they urged that the lead would "give" a trifle if the pipe moved. At Columbus we have for a long time confined ourselves exclusively to the cement joint. This is an interesting question, and it has also excited a good deal of discussion at the Columbus works, in which sharp differences of opinion were at times brought out.

Mr. Bate—I know very little about cement joints; but with regard to Mr. Huntington's statement as to the honeycombing of lead joints, it is just possible that may account for an experience I once went through. When I took charge at the Tiffin works there was a heavy leakage all over the city. One could hardly walk the streets without encountering the smell of gas. I at once overhauled the conduit system until now we have less than 1,000 feet of the pipe underground that was doing duty when I assumed control. I encountered leakage almost at every joint. I had an idea that the lead was eaten away. I found that what was supposed to be a corrosion was simply an opening of the space between the inside ball and spigot end of the other pipe, so that when the joint was run there had been no chance for the lead to flow back into the interstice. I found on some inside sections places where there was perhaps not a quarter of an inch of lead to interfere with the leakage of gas; then in other places it might run back 2 or 3 inches. As to the "giving" of the lead, I discovered places where the pipe had drawn one-half inch, and I imagined if that was caused by expansion something "would have been pulled loose." I made all lead joints, making it a point to use about twice the quantity of lead set down in the formulas, and now I have no leaky joints.

Mr. Robinson—The condition of our pipes was thoroughly arrived at because of the fact that the pavement of the main street in our city of Columbus was being torn up preparatory to relaying. The time being of course favorable to look after our mains, we tried each joint, finding escapes of gas at almost every one, some being really bad cases. The remedy employed was to tap up the lead and put in what our superintendent called a "wiped joint." Afterwards, when the Parisian style of pavement was put down, we took this conduit up, and replaced it by two mains to right and left of street, doing this so that when putting in services we would not be obliged to dig through an unnecessary length of the asphalt and rock materials composing the new pavement. The new mains were of much larger diameters than the one they replaced. The new joints were made of cement. Our Board had concluded it was good policy to cease using lead. We also had experience with a tar or asphalt-coated pipe. We did not put down any great length of it, but did find that the influence of the gas on the coating was such as to finally reduce the covering material to a sort of paste or powder. That condition reached, the joints commenced leaking all around; and it seemed to make no difference whether lead or cement was employed to make the union. This experience induced us to abandon coated pipe, and for the last 15 years nothing other than plain, uncoated pipe, fitted together in plain cement joints, has been used at Columbus.

Mr. Fullagar—Have you noticed what action naphthaline (particularly in Spring) has on cement?

Mr. Robinson—We once took up an entire line of 4-inch pipe, running through Third street of our city, with the intention of substituting a larger conduit. The joints on the stripped line (they were laid in cement) were thoroughly examined. It was found that the cement we had used—it was the best quality of Roman cement that we could purchase—had become apparently about as hard and impervious as the iron itself. It seemed to adhere to the iron with remarkable tenacity. About the only trouble we found with it was that occasionally a pipe would have to be pulled apart. There was no "give" to the joint; it was about as "stiff as a rail." I might say that our soil is admirably adapted to the maintenance of pipe in original condition, it being a firm, gravelly loam. I do not know of any serious case of "pulling apart" that happened with us during our use of the cement joint. Of course we have an occasional leak, just as is the experience of other gas managers.

Mr. Fullagar—I have observed statements emanating from engineers in various cities that, on removing pipe laid with cement joints, they often discover the under part of joint in a pliable or plastic state. I remember one case where a line of all cement pipe about 800 feet in length, and laid to carry foul waste away from the condensers, caved in at the end of third year. It seems to me to be only a question of time when engineers who have made the change from lead to cement joints invariably go back to lead; and I would estimate the time it takes to convince them as to the superiority of the leaden joint at between eight to ten years.

Mr. Bushnell asked Mr. Robinson whether he could state the comparative cost as between cement and leaden joints.

Mr. Robinson—I am not able to answer that question. I can tell you the price of cement, but could not say as to the difference in cost between quantities of each material requisite to make a joint. Our method of making a cement joint is this: First put in a band of oakum and pack in the cement; next add a second band of oakum, and close the mass up solidly by tamping; outside of that filling make a wiped joint.

Mr. Bate—When Mr. Robinson was speaking of the joints being "as stiff as a rail," it occurred to me that there was a question as to the durability. At one period I used wrought iron to a considerable extent, because I could place it quicker and, at that particular time, buy it very cheap. I put down about 700 feet, making allowance here and there for an expansion joint. I had to use the joint on account of, or to provide for, extremely cold weather. This line showed a very heavy expansion and contraction movement, and if the pipes had been screwed closely together they would have broken apart. Now, on ordinary cast iron mains with lead union I have never had a joint to break.

Mr. Enfield—I have had but little experience with the cement joint, and that trifling experience is not favorable to the practice. Certainly, there are a good many sorts of cement. The Columbus people use Roman cement; the cement I tried was known as "Louisville," and the "Louisville" description had always been employed at the works with which I have been connected. During last summer, in looking after leaks, I had occasion to inspect a great many joints. I did not find any very large escapes, but almost invariably I found that the cement had parted from the pipe, and oftentimes had cracked so badly as to permit slow escapes of gas from the main. When laying pipe last summer I put in one lead joint to every nine or ten lengths. Good yarn should be inserted, and the good tight yarn joint should be completed with a good lead finish. Yarn is elastic; and I have

seen it taken from joints, where it had been concealed some 10 or 15 years, still remaining elastic and tough.

Mr. Gwynn—The last speaker said that he used "Louisville" cement. Now, in my opinion "Louisville" cement would be utterly worthless for the purpose specified, as it will not stand when exposed to low temperatures. On the other hand, joints made with Portland cement will stand freezing without becoming impaired. In 1879 I laid two miles of pipe in the town of Upper Sandusky, putting it all in with Roman cement joints. I remained at that works until 1882, and can safely say our annual leakage loss did not exceed one per cent. Since '82 I have not visited that town, but have heard through inquiry that they have not had a case of pulling apart or breaking of the joints put down six years ago. I had rather looked forward there to broken joints as a consequence of contraction. I think a properly laid cement joint, with lead joints say every 500 or 600 feet apart, the best system that can be followed.

President Hickenlooper—Does the gentleman mean to say that the leakage was less than one per cent.?

Mr. Gwynn—Yes, sir.

President Hickenlooper—What kind of gas was it?

Mr. Gwynn—An oil gas. I had no choice as to the kind of joint or material; these were specified by the engineer.

Mr. McMillin—I fail to see how it is possible to lay a system of mains all over a city, putting in cement joints exclusively, and not only have leakage, but also a great deal of it. I cannot understand how it would be possible to get leakage down to one per cent. with any kind of joint, but more particularly so when employing cement. If you put down 10, 15, or 20 miles of main, often the mileage of many small towns, and then notice the difference of temperature that probably occurs in the ground between the heat of summer and the cold of winter, and make calculation of the expansion and contraction of that length of pipe, you will probably find that the mileage is from 50 to 100 feet longer in summer than in winter. I do not like the cement joint myself—certainly not when used exclusively. They have not had many broken mains in Columbus. In other works that I have control of, where cement joints are used exclusively, and where the leakage should be small, it is sometimes really very great. In towns where the temperature sinks to —30°, something has to give. I think it bad practice to put down cement joints, and I particularly disbelieve in their exclusive use.

Mr. Gwynn stated, with reference to the one per cent. leakage, that there was no day consumption in Upper Sandusky. The holder would stand all day without rising or falling an inch. He thought this was very good evidence that there was no leakage.

President Hickenlooper—Who built that holder?

Mr. Gwynn—I think it was built by a Pittsburgh firm.

President Hickenlooper—I had hoped you would say the Stacey Company.

[The discussion here branched out into a consideration of the best method for discovering leaks; and the general weight of the testimony favored the "nose and probe" system. Messrs. Bushnell, Bate, Hamlin, Salter, Hickenlooper, McMillin, Fullagar, Taylor, and Printz were among those who gave their experiences on the subject.]

Two papers were submitted on the eighth subject of Secretary's Circular, Messrs. Eugene Printz, of Zanesville, and William Enfield, of Columbus, being the contributors. In accordance with the practice before instituted in the case of dual papers, the communications were read by the authors, their presentation being followed by a joint discussion. The subject treated of was,

WHAT PERCENTAGE OF THE LOSS OF GAS IS DUE TO LEAKAGE, AND WHAT TO CONDENSATION?

Mr. Printz first commanded the attention of the members, and he read as follows:

I scarcely can conceive why our Secretary should have assigned me the duty of preparing a paper on this particular subject, as it is one on which I had not given much thought previous to his writing me. His request was to prepare a short paper for the purpose of provoking a discussion on the subject; and if I succeed in doing this much, even should I not present anything new, I shall be satisfied, and think I have at least tried to perform my duty toward the Association.

Now, as the percentage of gas unaccounted for varies greatly in different localities, and from many sources—such as imperfect main pipes, improperly made joints, carelessly connected and leaky service pipes, public lamps allowed to burn over schedule time (when the gas is not measured by meters), and with burners on the lamps larger than the size agreed upon; and, again, we have long lines of main pipe with but few consumers, or small mains requiring excessive pressure to supply the demand on them, thereby increasing the loss from actual leakage, consumers meters registering too slowly—all these are among what we designate as external causes, *i. e.*, outside of the manufacturing department of the gas plant.

In the works proper we have, for instance, as likely causes of loss, water carried above the true line in the station meter, causing a proportionate increase in registration over the amount actually passed; or, as is too often the case, the gas is measured at too high a temperature—instead of the standard 60° F., it is nearer to 70°; indeed, many times, as you all no doubt have noticed, as high as 80°. Now, as each degree above 60° adds, in round numbers, one foot in volume to five hundred, we will have for every five degrees above 60°, ten feet to the thousand; or, in other words, one per cent. of gas for every five degrees above 60° to be accounted for at the end of the year as lost by leakage; all going to show that what proportion of the loss of gas should be assigned to actual leakage is certainly a very difficult problem to arrive at.

A loss from leakage that would in one locality be considered a very small percentage would in another be reckoned as very high, considering the total amount of gas made; yet the real number of feet lost may be the same in both cases. For instance, the first may have a daily send-out of 100,000 cubic feet, with a loss of 5,000 cubic feet per day, or 5 per cent.; and a second case, with a daily send-out of 50,000 cubic feet, with a per diem loss of 5,000 cubic feet, or 10 per cent., will show that, while the apparent percentage of loss is doubled, yet the true loss is really the same actual quantity in thousands of feet. Again, one may have a greater number of miles of main pipe than the other, with the same loss per mile of pipes, and yet the one with the longer line of pipe will have the larger percentage of loss on the same make of gas per day. Were it possible to have the main pipes and services perfectly tight, and placed deep enough in the ground to prevent undue condensation, and with diameters fully large enough to supply all demands for gas at a moderately low pressure, consumers' meters registering correctly, with a true statement of gas consumed by public lamps, and particularly to have a correct registration on the station meter, then the percentage of gas lost by actual leakage should be very small indeed.

Loss by Condensation.

Some gas men claim that the loss from condensation is so small as not to be worthy of any consideration; this reasoning they justify on the ground that the naphthaline and other rich vapors condensed at one time are taken up at a later period, and are really carried on and not lost. This may be true; I hope it is, and will consider it so for the present. I have construed this question to mean not the condensation of naphthaline and other rich constituents of gas; but the condensation of aqueous vapor that may be, and is, taken up by gas in its passage through or over water—the amount or percentage depending on the temperature of the gas at the time. We find in "Clegg's Treatise on Coal Gas," at page 50, a table exhibiting the proportion by volume of aqueous vapor existing in any gas standing over or in contact with water at certain temperatures. At 40°, for instance, we have a given volume; at 60°, double that volume; and at 80°, four times the first volume. Now, I have reason to believe that in many gas works the conditions do exist by which a great amount of aqueous vapor is measured by the station meter as gas, and afterwards condensed on its way to the consumers' meters, it afterwards turning up on our ledgers in the shape of "unaccounted-for-gas." The gas passes the washer at a moderate temperature, is copiously washed with water; thence to the purifying boxes, containing lime which is necessarily very wet. The temperature there is raised considerably, and the gas absorbs or takes up water as vapor; now, the distance from the center-seal to station meter is too short to allow the condensation of but very little, if any, of the aqueous vapors, and they are measured as so much gas.

With the view of ascertaining practically the percentage of aqueous vapor in our Zanesville gas, I made a series of experiments, or tests, taking the gas just before its entrance to the meter, passing it through a box of dry lime, carefully measuring it before entrance and after exit, and from the difference calculated the percentage of moisture, purposely making the tests at such times that a number would be on days when the outside temperature was very low, and the others when it would be at a moderate degree.

At the Zanesville gas works we carbonize native coals which produce a gas containing a large proportion of the sulphur compounds, compelling the use of larger purifying boxes than usual for the amount of gas made, thus exposing the gas to a large surface and contact of wet lime. We have a Pelouze and Andouin condenser, ordinary pipe condensers, a tower washer, four purifying boxes, each 3′×10′×20′, and thirty-five feet of pipe from center-seal to meter. I will read you the results as given by four of the tests, together with the temperature at the time the tests were made:

Temperatures, Degrees Fah.	Test No. 1.	Test No. 2.	Test No. 3.	Test No. 4.
Outside atmosphere	18°	11°	37°	38°
Gas at entrance to condensers	108°	94°	102°	107°
Air of condenser room	60°	54°	70°	67°
Gas at entrance to washer	58°	55°	68°	66°
Air in washer room	48°	42°	56°	60°
Air in purifying house	...	...	64°	63°
Gas at station meter	70°	68°	80°	77°
Air in meter room	70°	70°	72°	70°
Percentage of loss by moisture	.77	.80	1.83	1.40

Average percentage of the four tests, equal 1.20, which is equivalent to 12 feet to the 1,000.

The two first tests were made while we were putting out a daily make of about 90,000 cubic feet; the two last being taken when the make per day was 110,000 cubic feet. You will notice that in "Test No. 3" the percentage is much larger than is shown in "Test No. 4"—the temperatures of both being nearly alike. That difference of temperature I seek to account for in this way: Just previous to the time of "Test No. 3" a new or clean purifier had been turned on; but during the time of "Test No. 4" the purifiers were about ready for changing, thus giving "Test No. 3" the advantage of a box of very wet lime to work on.

While abstracting the moisture I made several tests; but could not detect any difference in the candle power of gas, either before or after passing it through the dry lime.

I am fully aware that the percentage of loss chargeable to the condensation of aqueous vapor, or the percentage which may be caused by registration at too high a temperature, will not affect the result as to the dividends of a gas company nearly as much as will the loss arising from leakage pure and simple; but it surely is difficult to persuade a stockholder that such is the fact—a percentage of loss to them is taken as such, no matter whether it be real or apparent.

Mr. Wm. Enfield was then introduced, and that gentleman occupied the attention of the Association in the following manner:

Mr. President and Gentlemen of the Ohio Gas Association:—It gives me pleasure to come before you with a few thoughts pertaining to the ratio of loss in unaccounted-for-gas chargeable to leakage and condensation, respectively. I am fully alive to the fact that I shall occupy the debtor side in the reading of this paper; and I want to thank you beforehand for your generous attention.

At the start I must acknowledge that I, at least, have no "knockdown" arguments on the matter in question, but hope that it may start some of us into a research which may aid and enlighten us.

In this proposition which we now make our text there may be many questions, with little of definite truths or data; but there may be some valuable suggestions which, in the absence of clear facts, may lead us to as satisfactory a solution of this problem as the case admits of.

Let us first deal with condensation, and how it occurs, looking also at the various causes which lead to the liquid depositions which we find in our mains and drip-boxes, and which we indiscriminately call condensation; and having arrived at some reasonably satisfactory conclusion as to the leakage, we may then, perhaps, assume a near approach to solution.

The general rule is to measure gas by the station meter before passing it into holders at a temperature as near 60° Fah. as possible. In some well-regulated works the custom is followed of correcting the volume of gas to mean temperature and atmospheric pressure, by reading the meter, thermometer, and barometer at stated intervals during the day, and making the necessary deductions or additions to the volume recorded. The general effect of these corrections is to reduce considerably the volume made as recorded by the station meter, notwithstanding the additions made during extreme low temperatures. In using these means we do not reduce the leakage and condensation, but simply make a nearer approach to a correct record, and thus avoid debiting an account with an undue charge.

Now, if we have put our gas into the holders, and have got, as nearly correct as is possible, the record of its volume, we may try to ascertain where that whole volume goes to. First, we are aware that this volume of gas carries with it a certain amount of watery vapor, and some vapors of the heavy hydrocarbons. Some of these vapors may have passed over from the retorts in the process of distillation; others may have been taken up by absorption and evaporation from the water in the holder tanks. This last cause of vapor in our gas may not be taken into account so far as the volume recorded is concerned; but will go to help explain the cause of the liquor found in our drip-boxes, etc.

It is an easy task to measure our gas and correct its temperature, etc., at the station meter; but not so easy to decide its temperature at the various points where we measure it to the consumer. We may, perhaps, average temperatures approximately, and get a partial view of the changes gas undergoes in distribution. For instance, we may take the average temperature of gas in our mains at, say, 45° Fah. Any diminution in volume between the measurement of gas at consumers' meter and station meter must go to leakage account; but we nevertheless now have one cause for the deposition of liquor.

The average temperature we estimate at 45°; this is 15° below the temperature at station meter, and as each 5° make a difference in volume of about 1 per cent., we may reason this as a cause of about 3 per cent. in our leakage account. Now, in the same line, we have 15° of decreased temperature which will make a difference in the quantity of liquor vapor carried by the gas. At 45° temperature, barometer 30 inches, gas will carry about 1.13 per cent. of vapor, and at 60° temp., bar. 30 inches, about 1.87 per cent; or at the former temperature, .74 of one per cent. of volume less than at station meter. This three-quarters of one per cent. may be charged directly to condensation, and with it, perhaps, a small percentage of the condensable hydrocarbons. But I have a very grave opinion that the percentage of heavy hydrocarbons which may be dropped after passing the station meter, at ordinary temperatures, is very small. Whence then comes the liquor which we find in our drip-boxes, mains, meters, etc.? My answer would be, chiefly from leakage. Such imperfections as will let gas out will also let water in.

We have found how three-quarters of one per cent. of the volume measured by station meter may be deposited as condensation, and we may add to that whatever vapors may be suspended in the gas by any increase of temperature above 60° imparted to the gas in the holders where it stands over water. For example, we may put the average temperature in the holders at 70°, or 10° above the mean temperature as measured, and at this increase of temperature the gas will carry an additional amount of vapor of about .7 of one per cent., which, notwithstanding it does not affect the leakage account, does help to make the liquor in our drips. I might add here that to take the average temperature for the amount of vapor carried in gas is not strictly correct, because the quantity of moisture carried increases as the temperature increases, as you may notice in my figures—the percentage between 45° and 60° being three-quarters for the 15°; the percentage between 60° and 70° being .7, or nearly as much for the 10°.

We have in our experience often noticed the quality of the liquor pumped from our drips, and in the case of coal gas, I think, are about ready to decide that it is little but water pure and simple. We have noticed also that in low, wet districts we find more of this liquor in our drips than in high and dry localities. The trouble in the former cases sometimes almost amounts to a daily necessity for pumping; while in the latter cases drips seldom, if ever, need pumping.

As a further evidence of the incondensability of coal gas I may give an experience that occurred during the writing of this paper. We have three holders, one large and two smaller; and as the consumption commenced falling off during February we did not need the gas in one of the smaller ones, but kept it as a reserve for a period of two weeks. The holder at the beginning of this period was full to within a half sheet, the temperature remaining much the same during the whole period. At the end of the two weeks there was a decided change in the temperature, when the holder quickly lifted, and we had to let some of the inflated gas pass out in order to prevent "blowing." The holder rose and fell with the temperature right along until the temperature increased so much at the end of the two weeks as to expand the gas beyond the capacity of the holder.

We have had occasion to notice the influence of temperature on coal gas in this paper, and may add here a recent experience in that line. I had occasion to put up a Jones jet photometer in our works, and the half-inch pipe to supply it was run along a wall rather highly heated by steam pipes and a steam boiler. This same jet photometer had previously registered from 17 to 19 candle power in another part of the works; but on placing it where the gas in the supply pipe became abnormally heated, it did not show more than from 14 to 16 candle power. Of course, the governor of the photometer passed only the given quantity of inflated gas, and the loss, or difference, was shown in the reduction of illuminating value.

Now to recapitulate somewhat. We have in our view, from the assumed data used, a most probable three-quarters of one per cent. of condensation from decrease in temperature, and, to be very liberal, we may add to this another possible three-quarters of one per cent. for the deposition of hydrocarbons, etc.—making together 1½ per cent. of the volume of the gas recorded; and here, for my part, I would draw the line. We have also found, under the same assumed data, a probable loss to be charged to leakage from decrease in temperature of 3 per cent. Summing up, we have 4½ per cent. of loss without allowing anything for real leakage; and we may now ask what should be the percentage of actual leakage under which we might rest easy. Without entering into further details I would say that, for cities having a good or fair consumption per mileage of mains, not more than 3 per cent. should be tolerated. Adding this to the 4½ per cent., we would have 7½ per cent. as the maximum unaccounted-for gas for a well laid and well cared for set of mains.

I have heard of distributing plants which gave less than 5 per cent. of unaccounted for gas; but not in this climate, nor affected by the wide range of temperature under which we suffer. I am ready to believe anything that is good, if it do not seem too good; and quite believe it possible that, in ordinary cases, the maximum leakage and condensation account can be kept somewhere between 7 and 8 per cent. average per annum. The day is fast passing when we can quietly suffer our unaccounted-for gas to remain at the almost criminal proportions of between 12 and 20 per cent.—especially as the prices of gas are on every hand falling to bed-rock. Like "little foxes," our little leaks are stealing away the profits. The big leaks we hear of and secure readily; but the little ones dodge and almost defy us. These little fellows

once left in our tracks are hard to find, but their multitudinous action will stare us very hard in the face. Will we not learn the lesson contained in the old adage, "Prevention is better than cure!" Never was this truer than when uttered in connection with the topic of gas mains.

Discussion.

Mr. Bushnell—I believe that if the members would give figures as to their actual loss of gas, either from condensation or leakage, we might find out the lowest percentage, and profit by its methods to the extent perhaps of cutting down our loss to the proportions spoken of by Mr. Enfield, who thinks it should be in the neighborhood of 7½ per cent. At Springfield the loss runs up to 12 and even 15 per cent.

Mr. Hamlin—Some five years ago I became interested in the Wilmington works, and at the outset our unaccounted-for gas amounted to about 15 per cent. We then introduced the system of "probing" for leaks, and soon (1884) brought the loss down to a figure represented by 10.83 per cent. It should really have been less than that, as we keep no account of gas consumed about the works. I hope to do still better. I would like to hear an expression of opinion as to what the average loss should be in works of the capacity of mine.

Mr. Bowers stated that his unaccounted-for loss during the first year ('82) of his connection with the Hillsboro works was over 18 per cent.; the next year it had fallen to 16; last year to 15. He took hold of the management as a "greenhorn," and knew nothing whatever about pressure or like details. He thought the greatest trouble at Hillsboro was the pressure they had been working under—24-10ths. This, he concluded, accounted for the 18 per cent. leakage.

Mr. Huntington—The leakage at our Columbus works, during a number of years, has ranged between 12 and 18 per cent. We have sometimes thought the figure was pretty large, and would be highly pleased to learn some method of decreasing the percentage.

Mr. Printz—At the Zanesville works our loss is about 14 per cent. We have quite a main mileage laid for street lamp supply only; and perhaps on one-half of our mains we have no private consumers. During a spell of severe economy we put down some wooden pipe, and its possession has given us great trouble. Next year we propose to take it all up, and this action will undoubtedly reduce our leakage account.

Mr. McMillin—I think the two papers just presented were about as interesting as any that I have ever heard read before this or any other meeting. The writers have gone thoroughly into the subject, and told us how much loss was due to condensation and how much to leakage. We should not undertake to find leaks until we are certain we have them. One gentleman has reduced his loss to 4½ per cent. After getting it down to that you really have not got any leaks. The amount of leakage a gas company ought to have from its mains is something pretty difficult to tell. The conditions are so entirely different as to preclude the fixing of any rule that could be made hard and fast. Even after the fixed figure had been given, you would not know much nearer than before as to whether or not it was a reasonable loss. The leakage at our works in Columbus is very large; and, getting back to an old subject, I think it is very largely due to the lack of any expansion joints. Leakage ought to be less in Columbus than at Zanesville. It ought to be greater, perhaps, in Columbus than in Cincinnati; but you cannot draw a line by saying it is proper to run up to 8 or 10 per cent. in all places, or that a man who does not get down to these figures is not doing good work.

President Hickenlooper—Ten years ago our loss at Cincinnati was 13½ per cent. We then instituted an extremely rigid system of main inspection, which resulted in a decrease to 11 per cent. My own judgment is that you will find much of your loss is attributable to slow meters. You all know that a very large proportion of incorrect meters are registering against the company. We followed the main inspection by a careful house-to-house meter test, which resulted in showing that out of all the meters not registering absolutely correct 95 per cent. were slow. This confirmed our judgment that a very large proportion of what is usually termed leakage is but the under-measurement of consumers' meters. Three years ago our leakage was 11 per cent.; two years ago, 9½ per cent.; last year, but 7½ per cent. Good sometimes grows out of evil; and much of this good came from the visit of a so-called friend of the consumers who visited our city some time since for the purpose of making independent tests of consumers' meters, and thus expose the thieving propensities of the gas companies, for which he received, from credulous consumers, $5 per meter. They could, of course, have had a much more accurate test made upon application at the office; but, I suppose, preferred not to trust the company's agents. He worked here very industriously for two or three months. The possessor of every *fast* meter at once reported, but the happy possessors of many more *slow* meters failed to notify us. When the gentleman was through and about to leave for pastures new I sent for him and offered him 50 cents each for his list of slow meters. As he had already received $5 from the consumers, he gladly accepted this offer; and we certainly never made an investment that paid better. It at once occurred to me that a careful system of test-meter house inspection would be an improvement upon the old and more laborious plan of bringing all meters in for inspection. It occurred to me that if this man could go around town and make tests that approximated to correctness, why could we not do the same? We now have four men employed, and they make a systematic inspection from house to house. If they find a meter running approximately correct it is not disturbed, otherwise it is immediately ordered in for a more careful test. In that way we have found a larger number of slow meters than I had originally supposed existed; and if you, gentlemen, will look in that direction, I think you will find a similarly large proportion.

Mr. McMillin—Regarding the meters taken out and tested at the request of the consumer, and also noting the old meters tested at Columbus, you will find a paper (giving the statistics) that was published in the American Gas Light Journal,* which shows that the grand average of tests proved "slow" by .44 per cent. In making up that estimate meters that failed to register at all were excluded. Sometimes the consumer gets gas when the meter does not register.

Mr. Enfield—I think, putting this and that together, we can get upon pretty good standing ground. You have sounded a pretty good point as to the registration of meters. No doubt much unaccounted-for-gas may be traced to that source. If a sound system of testing be adopted, and then what I said in reference to preventing leaks in gas mains be adopted—being sure that we get the best mains, and then, above all, get the best men to lay them—I think we can get down to the figures I gave, speaking of any ordinarily good gas consuming community.

President Hickenlooper—I think another trouble will be found in the over supplying of your street lights. You will generally find a street light consumes more gas than your contract requires. I have no doubt you will find when you are required to furnish but four feet, you are oftentimes furnishing 5 or 6 feet.

First Day—Evening Session.

Leakage and condensation having been disposed of, Mr. Geo. Tayler, of Warren, read the following paper, in response to the question of—

WHAT IS IT THAT OBSTRUCTS THE SERVICE PIPES, TO LAMP POSTS AND TO CONSUMERS, IN EXTREME COLD WEATHER; AND IS THERE ANY WAY TO PREVENT THIS ANNOYANCE?

The annoyance occasioned by obstructed service pipes during extremely cold weather is a double one. It annoys not only the employees of the gas company, whose duty it is to keep the services clear; but also bothers the consumer, who, perhaps when he most wants light, finds himself without it.

To determine what it is that causes these obstructions, and to devise a plan by which the annoyance can be banished, is well worth the time and attention of this Association.

If you will look into one of these obstructed pipes you will perceive a sort of white frost, which placed in the palm of the hand soon dissolves into an oily, watery substance, with an odor somewhat similar to that emanating from the drip-pump; and it would seem as though the deposit had materially decreased the illuminating power of the gas. This substance, in my opinion, has been congealed from aqueous vapor, and vapors of volatile liquid carbides of hydrogen (which, in the retort house and condensing room, we have been so anxious to retain in our gas), but mainly from the former.

The only positive cure for this annoyance is to protect the pipes from the harmful action of frost and extremely cold weather. Mains must be laid below the possible reach of frost, and all exposed places must be avoided. To do this is no easy matter; indeed, in most cases, is impracticable. If the mains are not laid below the reach of frost, then the service pipes cannot be secured; and so we must take our mains where we find them, and, in many cases, do likewise with our services also. Yet, with proper care in laying the services, and in protecting them afterwards, the annoyance can, I am satisfied, be reduced to a minimum.

I have been many times bothered by these stoppages; and, in a great majority of cases, have located the trouble at the point where the service pipe came in contact with stonework or brickwork. Whenever practicable I have cut away the masonry and encased the service in a wooden box or tube, being careful to leave an air space between the service and its covering, and also to protect the air space from any accumulation of water. This I have found to be very effectual. When this could not be done I have changed the location of the service. When I have had exposed or open spaces to contend with—such as vaults under sidewalks, and basement passageways in front of stores, I have gone around them whenever possible; and to this end have supplied several stores by means of one large service. When this could not be done I have protected the service pipes in the same manner that I

* Vol. XLI., Dec. 16, 1884, p. 315.

protect them from contact with masonry, at the same time avoiding any angles in the pipe.

With lamp posts, a great many of which stand near the curb of the stone sidewalks, I have found stoppages, the causes of which were traced to the service being in contact with, or in close proximity to, the curbstone, which extended into the ground—sometimes to the depth of thirty inches—carrying the frost down its full length. For some lamp posts I employ one-inch pipes, but never set a smaller size than three-quarter-inch. I take care that the openings through which the service enters the post are closed, so that no earth can fall in around the pipe, or about the elbow from which the pipe rises to the burner. I also stay the pipe in center of post so that it cannot come in contact with the post at any point.

With these precautions, I have now only four service pipes to consumers which have frozen up this winter; and their location will be changed before the winter of '85 sets in, so that they will then cause me no further annoyance.

With lamp posts I have not been so fortunate, as fifteen of these have frozen up. This, however, is a great improvement over former years.

Discussion.

Mr. Bate—One of the questions intended for construction was, what caused the obstructions. Of course, services, when closed up in cold weather, are generally described as being "frozen up." Now, the real point is, does the trouble arise from naphthaline, or is it occasioned by true frost formation? If it be naphthaline, are there any steps which we may take at the works that will prevent its appearance? I have always considered these deposits as the result of frost, and have treated them as such. I have only some five or six services that give me any bother, and these are at places where I could not put in a service without crossing areaways.

Mr. Bowers—Talking about passing through areaways, I think that would not have any effect upon the gas. We have at Hillsboro about 20 services passing through areaways, and not one of them had frozen up during this winter. In reality, where the services are best protected there do we have the greatest trouble; and at my own home, with the service 2½ feet underground, I had a very perplexing case. A new dry meter had been put in; after two weeks from time it had been placed we could not get a foot of gas through it. That meter, on examination, had a pint and a half of water taken out of it. That was the first thing of the kind that had ever happened with me. I took that meter out on the eighth of February, fixed everything up all right, setting it right back again—on the 16th no gas could be had. I cleaned up things again, taking out more water, and expect when I go back, or shortly thereafter, to repeat the operation. Can anyone here tell me why so much condensation should appear at that particular spot? We have had so far this winter about ten lamp post stand-pipes, or services, that gave us trouble, but a pint of alcohol opened them up.

Mr. Bate—Mr. Bowers claims that services passing through open areaways should not be affected by these stoppages. It is at such points that my services invariably freeze.

Mr. Wood—A service pipe to Sandusky County Jail, for the first time in 9 years' of duty, was frozen up on a recent occasion. A portion of the service was filled with a solid mass of ice. That trouble may be traced, I think, to the fact that in the cellar through which the service passes is located a boiler which generates steam to heat the building. During the winter the walls and ceilings reek with water, and the exposed service pipe was wet all the time. We could not do anything with our force pump, and afterwards tried to soften the deposit with alcohol, using up, during 48 hours, much more of that spirit than I liked to spend on the experiment, and yet did not succeed in freeing the tube. As a last resort I had to run a temporary service. All our pipes through open areaways have frozen up. I have a 4-inch pipe running across our Market street bridge which has often given me great trouble in former years, but has not bothered me greatly this winter. I also have had trouble this winter with a service supplying the convent building, although hitherto it had worked all right. Then, again, I have a 2-inch pipe crossing another bridge that occasionally makes its presence known, while the service under the Barr street bridge, only a short distance away, never gave me any annoyance whatever.

Mr. Printz—At Zanesville we had supposed we were laying a short line of pipe along territory that would in time be occupied as a public roadway; after-developments proved that our reckoning was wrong, as a house was built over the land and our pipe was exposed while the cellar walls of the structure were being erected. Twice within the last ten days we have had that pipe (it is 50 feet long) frozen solidly up, with the consequence that the gas supply to the northeast portion of Sandusky was entirely shut off for a short period. We cleared out the obstruction by means of hot water application.

President Hickenlooper—Was it a deposit of ice or naphthaline?

Mr. Printz—Well, it was ice.

The President—How do you know it was ice?

Mr. Printz—From tapping the pipe at four or five different places. We have a six-inch line over one of our river bridges, and it has to be carefully looked to after a heavy frost followed by a thaw.

A member inquired of Mr. Printz what size of pipe was that running through the cellar spoken of.

Mr. Printz—Four-inch; and it is exposed to the air on all sides. We have had quite an experience in the freezing up of services; and, strange to say, the happenings are most erratic. Those which have never bothered us before will, without a moment's notice, close up tight; while, on the other hand, the offenders of a previous winter will keep right along on their good behavior. The nuisance is at its height during extremely low weather temperatures.

Mr. Kelly—In regard to that 6-inch line of bridge pipe—at what point do you find the ice chokes it up? Is not the difficulty experienced at the spot where it strikes the bridge; and is it not your experience that no trouble is encountered on the section passing under the bridgeway?

Mr. Printz—The ice forms where the gas passes into the exposed pipe.

Mr. Kelly—When it encounters the change from the earth temperature to the much lower one of the exposed main, of course condensation must ensue. Look at the panes in the windows to this room; the interior warm air striking the cold glass is deposited thereon in the shape of rime or hoar frost. If the internal atmosphere were now equal to that out of doors the frosty deposit would not manifest itself; and that I would offer as an explanation of Mr. Printz's bridge main stoppages. Where pipes are kept at equal temperatures there will be none of this bothersome experience. I have passed gas through mains underneath bridgeways, and below canal bottoms, and have always noted that if the gas were not obliged to encounter sudden chilling, stoppages from frosty condensation would never occur. Where the pipe comes out of the ground just at the bridge approach is where I have looked for and found frosty stoppages.

Mr. McMillin—Can Mr. Printz tell us what probable quantity of gas is passing through that uncovered main which he speaks of having "frozen up" on him?

Mr. Ptintz—I could not say.

Mr. McMillin—If you just make a calculation of the vapors passing in the gas, as stated in the papers presented here to-day—taking temperature of gas, say, at 40° F.—I think you will find it will require about 500,000 cubic feet to condense sufficient water to form that quantity of ice. You would require to send through an enormous quantity, and have every particle of it condense at the stated point in order to solidly fill that pipe with ice. It requires a large quantity of gas to produce moisture for even one cubic foot of ice formation; yet that pipe would hold more than four cubic feet of ice.

President Hickenlooper—Let me call your attention to the conditions. The statements made in the papers are based upon average conditions. This is an exceptional case. Might there not be a greater deposit, a greater condensation of vapor, under those conditions than under the circumstances as described in the papers? The writers do not demonstrate that there is no vapor in suspension in the atmosphere. Now, if you take extraordinary conditions, such as stated by Mr. Printz, is there not likely to be a much greater proportion of condensation deposited than the writers of the papers have set forth?

Mr. McMillin—I based the calculation on a well-known law of the quantity of moisture that any gas will carry; and the lower the temperature the less that moisture will be. This gas being exposed to nearly zero in the holder, you could not have more than one per cent. of moisture in the gas passing through that pipe.

President Hickenlooper—For instance, to illustrate my idea: If you have a steam pipe, protected for its entire length, and allow the steam to pass through it continuously, is it not conveyed along without appreciable condensation? On the contrary, pack that pipe in ice, and would you not find plenty of condensation?

Mr. McMillin—Not less than 500,000 cubic feet of gas would have to pass through that pipe, and deposit all its moisture, in order to make the 4½ cubic feet of ice there thrown down.

Mr. Printz—While I cannot say as to what quantity of gas passes through that main in a week, I can say that twice within two weeks we had to clear it out; and I cannot think that the obstruction was anything other than ice.

President Hickenlooper—Has any other gentleman, in his experience, had a pipe filled solid with ice?

Mr. Tayler—In the paper I have not touched upon pipes running across bridges, nor spoken about main pipes in the streets, because these matters were not what the questions referred to. The questions speak of service pipes. I have had a 3-inch pipe frozen solid with ice for perhaps 30 or 40 feet of its length, and it was laid at a depth of three feet below ground surface. The "freeze," though, was a simple case of "leak into the pipe." One and a half squares distant from the location of freeze, water was running into the main; and so there was nothing wonderful about it.

Mr. Bate—But still the question is, "Are we to consider this deposit as

ice or as naphthaline?" I once had a 2-inch main "freeze" up. I was at a loss to account for it until I learned there was a sort of sewer running underneath the street, the location of which I was entirely ignorant about until the stoppage occurred. I found from examination that the gas main was running right above the crown of the sewer. On digging down I found that the earth enclosing the main was frozen as solid as though it had been on the surface of the street. I built a fire about the main and thawed it out. A short distance below where the stoppage occurred there was a drip; when the pipe was freed we pumped two or three barrels of water (it was as clear as though it had come from a well) out of that drip. Naphthaline resolves itself into a dirty, greasy liquor. If naphthaline had been the cause of the obstruction why did not the drip collection show a dirty appearance? It may have had a trifling odor, but not marked enough to be especially noticeable. Speaking of mains crossing bridges, I am in accord with Mr. Kelly. Such stoppages are caused by the sudden change of temperature experienced by the gas. The "rising" side, I have noticed, is always the one where we have to administer the alcohol, never the other. I am inclined to think it is ice we are bothered with instead of naphthaline.

Mr. Coverdale—I never had any experience with pipes freezing up solidly, but I can remember several places where small diametered pipe was used in crossing bridges, and which gave no end of trouble. One situation that I remember was the case of a bridge conduit 250 feet in length, diameter of pipe being ¾ inch. That pipe would freeze up several times in the course of a winter, as you might well expect it to. I have always made it a rule to give service pipes plenty of "fall." I have known them to be carefully laid with a level; if so laid you will always have trouble with them.

Mr. Enfield—My experience with ice formation in pipes has been that I discovered it in the legs or drips that we put on at the end of service pipes in the cellar, or it has been found in traps along in the service pipes. Where pipes would run across an area or other open space, or lie shallow under a gutter, etc., I have found a kind of hoar frost, but not often solid ice. I have, as said, seldom found solid ice where pipes were laid with a proper grade. Of course, alcohol will readily cut through and remedy the difficulty for the time being. I have often thought that a good frost preventive remedy for pipes running across areas, or where the pipe made a sudden bend likely to be exposed to extremely low temperatures, is to enlarge the diameter. I would enlarge the pipe right where it crosses the area. Of course, this may not be a specific remedy, but the pipe, at any rate, offers a much larger space for the frosty accumulation to fill, and the cold snap might possibly pass away before the diameter was closed. I think, too, that we can accomplish much by careful laying of our services.

Mr. Bate—The gentleman said, "Give the service pipe as great a fall as you possibly can." Would that apply also to the lamp post services? I think the great difficulty with them is the putting in of short bends or ordinary elbows. I have known some superintendents who used bends of a larger size than the services, or even the riser itself, thus covering the entire elbow and lower section of riser where it arose out of the ground. A three-quarter-inch is my favorite size of service for lamp posts. I have had pipes to shut up on me, and after pouring in alcohol until I was ashamed to waste any more of it, I have "pounded a way through." My experience convinces me that this moisture congelation occurs not from the simple fact that the drip or watery vapor had been arrested at some point where it could not flow back into the mains, but should be attributed to the sudden chilling experienced by the gas on entering the portion of riser just above the ground.

Mr. Enfield—I think our general experience goes to show that real ice formation does not take place; but that it is a deposit of hoar frost. If you "pound" upon this hoar frost with a rammer you will very soon pack it into a hard and solid ice.

Mr. Fullagar—That is so. Put the funnel on, but never make an attempt at clearing the service with a rammer.

President Hickenlooper—What is the notable difference in appearance between this hoar frost and naphthaline?

Mr. Fullagar—After melting or dissolving naphthaline you will find a sediment deposited; but melt the stuff usually found in lamp post services and the liquor will be quite clear.

Mr. McMillin—I supposed, from the tenor of questions in Subject No. 8, they referred only to the stoppages in service pipes that had been properly laid. If the pipe was put down in such a manner that it would not carry off aqueous condensation, of course it will keep freezing up. I do not believe that that moisture was condensed from the gas—speaking of those instances where parties found solid ice in their pipes; but I do assert that these cases were the result of leakage. You may note that in pipes which clog up (especially those through areaways) the deposit adheres to every portion of the tube; and the aperture left for the gas to traverse, no matter how small it may become, will be in pipe center. The percentage of moisture carried in the gas is far too small to be able to clog a service up from day to day. Some services require thawing out almost every 24 hours. The stoppages are the consequences of naphthaline, or other heavy hydrocarbon deposits. If you put a rammer in at any one place of course you can pack these deposits up quite solidly.

Mr. Bate—Do you think, then, where you encounter one of those solid compounds spoken of, the formation is caused by a leak in the main?

Mr. McMillin—Yes, sir; if the obstruction is ice.

Mr. Bate—The hardest formation I ever encountered in our Washington street bridge main was noticed during the middle of March, 1884. I put on the pump, thinking possibly there might have been an accumulation of water in the riser. The pump failed to show such a condition of things. I opened the plug and could get no sign of gas. I poured a quantity of alcohol in, but finally had to "pound" through the mass. The straight supply is a four-inch pipe, buried at a depth of about seven feet, which should be out of reach of frost; and I hardly think I could have leakage from the riser pipe. I believe you will find our trouble from frost in services is much greater during early spring than in the height of winter.

Mr. McMillin—That this is so is not owing so much to the heavy frost as it is to intermittent spells of freezing and thawing. At the surface of the ground, as the temperature gets warmer, the scales of naphthaline drop down. Lamp services are always more troublesome at the end of a freeze than at the beginning of one.

Mr. Tayler—I think this hoar frost deposit arises mainly from vapor thrown down during the passage of the gas. Possibly some of the hydrocarbons may be included in it; but I incline to the idea that aqueous vapor is the chief offender. After the deposit has been reduced to a liquor by melting it does possess a trifling odor; but yet it is entirely free from sediment—in fact it counterfeits water very well.

Mr. Printz—Mr. McMillin may be right in respect to a leak in that four-inch pipe of mine; but I doubt it, and doubt it because we have never found any water in it. Some years ago I had a peculiar stoppage happen on a main at a point distant about a mile from the works. Probably four or five places in the length of it had closed up on me. That pipe was probably 30 inches under ground, and right where the stoppage occurred the street was so overshadowed that the sun did not strike the pavement at any hour of the day. We took out a solid lump from the main. It had never troubled us before, and it has not done so since. The main was perfectly dry. There was no water in the soil—the earth formation being firm and solid.

Mr. Enfield—The thought has occurred to me while listening to this discussion that perhaps where a pipe has a good grade—and we would suppose that all vapors condensed would be led into the drip-box—right where the cold temperature first touched it there was a joint. Now, of course, we cannot expect the spigot and hub to fit so nicely as not to leave some slight irregularity—even, perhaps a hole; and the same thing might perhaps be noted in connection with elbows or fittings to services passing through areaways, or to services in other positions where they might be exposed to extreme cold. The vapors carried in the gas, and possibly the heavy hydrocarbons, may condense to the extent of forming a tiny stream, and that stream may run down the grade until it comes to the obstruction. At first a slight particle adheres to the obstruction or crevice and there congeals, succeeding particles doing likewise, until finally the whole diameter of pipe at the affected spot is closed up completely. May not such be the case?

[To be continued.]

Testing Gas for Carbonic Acid.

The London *Journal* "notes" that a method for determining the proportion of carbonic acid in coal gas has been proposed and described by Mr. Blochmann. It is claimed for this method of analysis that it is simple as compared with the usual procedure, which requires experienced operators and special apparatus. The test consists in shaking up a certain volume of gas with a sufficient quantity of lime water, of known strength, until all the carbonic acid is absorbed. The quantity of lime water necessary for this result gives, by a simple calculation, the volume of carbonic acid in the mixture treated. For facility in recognizing the quantity of lime water required, some drops of an alcoholic solution of phenol-naphthaline are previously added to the liquid, until it acquires a clear red tint. If after agitation with the gas to be tested the liquid is discolored, it is an indication that there is still carbonic acid unabsorbed; and consequently more must be added until the liquid ceases to be further affected, when the reaction is to be regarded as complete. The lime water can be easily prepared. It is known that a cubic centimeter of pure water will, at the temperature of 17.5° C., absorb 1.276 milligrammes of lime; and that 56 parts of lime will combine with 44 parts of carbonic acid. Wherefore 1 c.c. of lime water is equal to $\frac{1.276 \times 44}{56} = 1$ mg., or 0.55 cubic meter of carbonic acid. If, therefore, 1 c.c. of lime water is exactly sufficient to neutralize the carbonic acid of 100 centimeters of gas, it follows that this gas contains 0.55 per cent. of carbonic acid; or, if the gas

contains 0.5 per cent. of carbonic acid, it will take $\frac{100 \times 0.55}{0.5} = 110$ c.c. of gas per cubic centimeter of lime water. Thus, if the graduations of the burette containing the lime water are to the volume of gas to be tested as 1 is to 110, the quantity of lime water contained between any two of these graduations will correspond to 0.5 per cent. of carbonic acid. An extremely simple arrangement for employing this test is constructed as follows: A glass tube, curved at right angles, enters a half-liter flask, the other end being in connection with the gas supply. The flask is filled with gas while held upside down, and (the gas pipe being slowly withdrawn) the flask is rapidly corked. To test whether the gas contains more than 1 per cent. of carbonic acid, the colored lime water corresponding to this proportion, as marked on the burette, is introduced into the flask and shaken up briskly for two or three minutes. If the water is still colored more must be added, and the same treatment pursued until the absorption is complete, when the quantity of water used gives the percentage of carbonic acid with sufficient accuracy for ordinary purposes. If sulphuretted hydrogen is present in the gas, the proportion of carbonic acid is apparently raised.

The Box and Waller Washer-Scrubber.

Among recent developments in the field of gas washing may be noted the apparatus devised by Messrs. Box and Waller, the patent right proprietors of same being G. Waller & Co., a firm well known to the English gas fraternity under the title of the "Phœnix Engineering Works," with factories at Southwark, London. The apparatus herewith illustrated was built by the makers to the order of the St. Albans Gas Works, and is calculated to pass 750,000 cubic feet in 24 hours.

The machine is made in several compartments, in each of which the same operation is repeated, the purification being carried a stage further each time until it is complete. The number of compartments is more than sufficient to effect the entire cleaning, so that should any of them be temporarily put out of order the manufacture would not be stopped. The gas is acted upon in two distinct ways; it is brought into contact with an immense area of wetted surface, and at the same time it is drenched by falling streams of water, which are deflected and splashed in all directions by obstacles which break their vertical descent. The same liquid passes through all the compartments of the apparatus in succession, the clean water first meeting the pure gas, and gradually picking up more and more impurities until it escapes at the further end where the crude product enters. By this arrangement a high standard of purity is obtained in the gas, and the ammoniacal liquor is not unduly diluted.

Fig. 1.

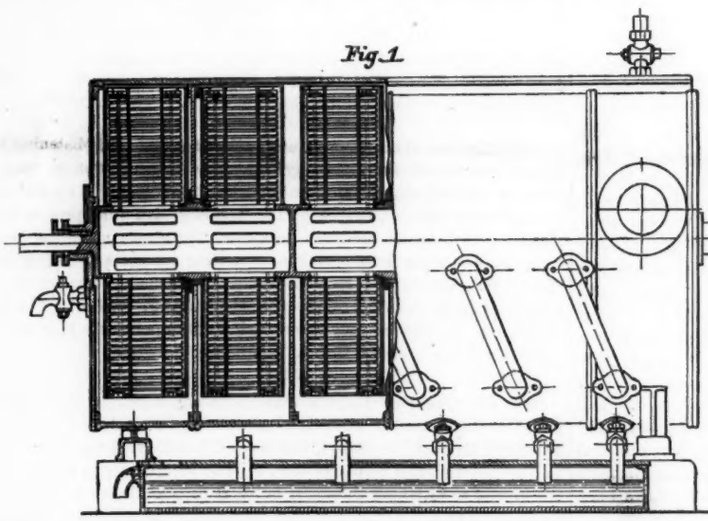
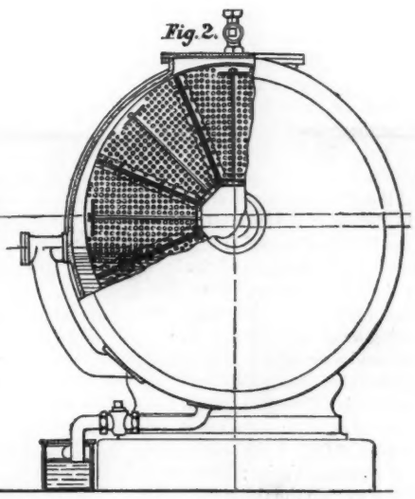


Fig. 2.



A central shaft, 14 in. diameter, runs from end to end of machine and rotates at about three revolutions per minute. Upon this there are built six or more washing wheels, each consisting of four wrought iron discs, of which the two outer form guard or division plates, and the two inner form the framework to carry the wetted surface and water lifting arrangements. These discs are pierced with about 1,000 holes, and carry between them short lengths of tubes spaced as shown in the engravings. These tubes are not perfect cylinders; they are stopped at the ends, and are slotted down one side, with an opening 12 in. long and ¼ in. wide, so that when they dip into the liquid contained in the lower half of the casing they become filled and carry their contents up with them for a considerable distance. As they rise the water in them begins to spill over the edge, and in a short time descends in a veritable shower-bath, the drops falling from tube to tube, and becoming broken and dispersed in all directions, so that the gas which has to make its way among the tubes is subjected to a continuous and most thorough washing. As the tubes empty they become filled with gas which is carried down below the general water level, and has to rise in bubbles.

Each washing wheel is situated in a separate compartment of the external casing as regards its lower part, the division rising nearly as far as the central shaft. But every alternate division extends to the top of the casing, and forms a complete barrier between the adjacent compartments, which at that point have no communication except through the hollow shaft, which is divided into short lengths by internal diaphragms. It thus follows that the gas passes through one wheel to the hollow shaft, and through the latter to the next compartment. Thence it passes outwardly through the wheel, and passing round the edges of it, proceeds inwardly through the next wheel to the shaft, and so on, following a sinuous course the whole length of the machine. The water flows through external pipes from compartment to compartment, being drawn off at the point where its specific gravity is the greatest. The tar is led away from the lowest point by pipes which dip into a tar main.

The casing is cast in four semi-cylindrical parts, and is bolted together by flanges not shown in the illustration. Each compartment is provided with a large manhole, and a testing tap by which the quality of the gas can be tried at that point.

We are indebted to *Engineering* for the details above given.

Manufacture and Use of Oxygen.

From a foreign source we learn that MM. Brin, of Passy, are producing oxygen on rather a large scale by the barium-oxide process. They have two large retort furnaces regularly going, filled with retorts of 2.80 meters length and 16 centimeters diameter. In these retorts they calcine oxide of barium, passing over it a stream of air which has first passed through quicklime to free it of carbonic acid. During this calcination the heat does not exceed 500° C., at which temperature the barium oxide absorbs oxygen, becoming peroxidized. The nitrogen is drawn off and passed into gasholders, to be used for making ammonia, etc. When the barium-oxide has absorbed as much oxygen as it can, the heat is raised to about 800° C., at which temperature the peroxide is decomposed, giving up again the absorbed oxygen, which is drawn off and pumped into a gasholder. MM. Brin make use of the oxygen so collected in many ways, one being the application of it to the purification of water. Filtered water is placed in a cylinder and saturated with oxygen gas at 300 lbs. pressure to the inch All organic matter is destroyed, and perfectly pure water results.

How Disease is Spread.

In speaking of this subject the *Sanitary World* furnishes the following practical illustration:

"A young Scottish lassie, in domestic service not far from the town of Elgin, died from scarlet fever in her 'place.' Her clothes were carefully packed up, and her 'kist' containing them was conscientiously sent home to her native village. On its arrival at the station there was the usual difficulty of getting it conveyed over the hills to the place of its destination, so

there it had to remain awaiting a friendly lift. Meanwhile the infected kist formed a happy hunting ground for the station master's children, who, in due time, all fell ill with scarlet fever. At last the friendly lift came, and the box (a large wooden one) was carried home, and the contents generously distributed among the neighbors. Needless to say that an outbreak of scarlet fever in the village was the result; and as to the station, where people do congregate and often have long to wait, it would simply be a center from which many a fever track would radiate, exciting the usual wonder whence and how the fever came."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Changes in the Postal Laws.—Towards the close of last Federal Congress one or two rather important changes were made in the postal rates, and for fear that these may have escaped the attention of our readers, we will reproduce their salient features.

I. The weight of all single-rate letters is increased from one-half ounce each, or fraction thereof, to *one* ounce each, or fraction thereof. The same increase of weight is allowed for drop letters, whether mailed at stations where there is free delivery, or where carrier service is not established.

II. All newspapers sent from the office of publication, including sample copies, or when sent from a news agency to actual subscribers thereto, or to other news agents, shall be entitled to transmission at the rate of one cent per pound, or fraction thereof, the postage to be prepaid. Equivalent to a reduction of one-half from existing rates.

III. Any article in a newspaper may be marked for observation, except by written or printed words, without increase of postage. These rates go into effect with 1st day of July, 1885, and their effect on the transmission of ordinary letters is to double the weight of postal missives at present forwarded at a tax of two cents each.

Lighting up Rittenhouse Square (Phila., Pa.) with Siemens Burners.—About the first of present month the 24 Siemens lamps placed about Rittenhouse Square, at the instance of the Philadelphia Gas Trust, were put in action. A couple of months ago it was noted in the Journal that the Siemens Company, after a warm contest with the electric lighting promoters, had received an order to substitute a certain number of their high-power burners for the "arc" lights that formerly did the night lighting in certain portions of the Quaker City. The Rittenhouse Square example has proved (indeed there never was any doubt at all as to the outcome) an entire success, and the Philadelphians are very much pleased over it. A local newspaper, in detailing the spectacle presented on the initial evening of the improved gas illumination, said: "The whole park, which contains about ten acres, was as light as day, and the broad asphalt walks were swarming with children darting about on roller skates—indeed, for a time, they turned it into a sort of free rink. The light from these lamps is very evenly distributed, having a most pleasing effect, since it causes no intense shadows. One can see to read a newspaper in any part of the Square, and the grass, as well as everything else upon which the light falls, retains its original color. The lighting effect is fully equal to that given off by 30 of the ordinary burners." Franklin and Logan Squares are to be illuminated in a similar manner, and the ferry slips at foot of Market street are to be lighted by aid of the Siemens improved system. Verily; Brother Stein and his business associates hath learned how to "do the thing up brown."

Cheaper Gas for Montreal Canada.—The Montreal Gas Company has made the important reduction of 20 cents per 1,000 from its former selling rate. Notification of the reduction bears date of April 15th, and the concession made took effect on consumption registered on and after May 1st. The gross price of gas to ordinary consumers, for gas used in illumination, is placed at $2 per 1,000, with a discount, for prompt payment, of 50 cents per 1,000—a net rate of $1.50. Gas supplied for other than lighting purposes—such as for heating, cooking, gas engines, etc.—is placed at $1.50 gross, prompt payment making net charge equal to $1 per 1,000. Gas furnished to street lamps is included in the lowest net rate. A small sum is annually charged for meter rent. Mr. Scriver evidently means "business," and we think (in fact we are sure) he is on the right "trail" after it.

Looking After an Increased Day Consumption.—Mr. J. Gwynn Superintendent of the Fostoria (Ohio) Gas Light Company, has determined that it will not be his fault if the day and summer consumption of the plant over which he has control is not greatly enlarged. The owners of the company are determined to second him in his efforts, and in order to facilitate the enterprise authorized him, on May 1st, to notify the people of Fostoria that gas used for cooking and heating purposes, between the dates of May 1st and September 1st, 1885, would be supplied at the rate of $1.50 per 1,000 cubic feet, making the proviso, however, that in each case a minimum monthly consumption of 500 cubic feet would have to be registered before the concession was available. We are emboldened to suggest that the discussion on the subject of heating and cooking by gas (had at the annual meeting of the Ohio Gas Association) had much to do with the determination arrived at by Mr. Gwynn, and is in line of showing how valuable such practical common-sense "talks" are. We have not the slightest doubt but that Mr. Gwynn's schedule will be kept up *after* 1st of next September.

Messrs. Tanner and Delaney Secure a Contract.—The Tanner & Delaney Engine Company, of Richmond, Va., through their Engineer, Mr. Wm. Simpkin, submitted plans to the managers of the new gas works to be erected at Knoxville, Tenn., for the general arrangement of the plant, etc.; handing in at the same time estimates for a good portion of the iron work, apparatus, etc. Several well-known firms of gas works builders had also furnished plans and figures; and, taken as a whole, the competition was a very spirited one. On April 22d the committee (composed of Messrs. Ross, Tuttle and McClung) appointed to examine the plans and award the contract held a meeting to dispose of the matter. They were assisted in their deliberations by Mr. J. T. Lynn, Superintendent of the Chattanooga (Tenn.) Gas Light Company, who had been retained as an expert. The examination lasted several hours, and the outcome of the session was that Mr. Simpkin's plans were adopted, and the contract for apparatus and its erection awarded to the Richmond manufacturers. The contracts for the buildings will be given out to local bidders. The money value of the bid made by Messrs. Tanner & Delaney is about $10,000—at least so we are informed. It is expected that the new company (its corporate name is, "Citizens Gas Company") will be ready to send out gas on or before Oct. 1st, 1885. A closing hint might be given to the effect that the water gas prowlers were most persistent in their attempt to erect a carbonic oxide death-trap there, but they were routed, "bag and baggage."

Obtaining Permission to Go Ahead.—On date of May 7 the directors of the recently organized Citizens Gas Light Company, of Westchester County, N. Y., obtained permission from the Mamaroneck town authorities to lay their pipes along the line of the turnpike and other public thoroughfares, with the condition that one of the Highway Commissioners be appointed to supervise the main laying operations. Can we call upon Mr. Van Benschoten, of New Rochelle, for some particulars regarding this Citizens Company?

A Mysterious Sort of "Company."—At Albany, N. Y., on afternoon of May 7, the "Avery Gas Company," through its incorporators, filed articles with Secretary of State. Its location as to future field of operations is surrounded with "gloom," although the "articles" are quite pronounced in the assertion that the corporation proposes "to manufacture gas, principally from petroleum, for illuminating and heating purposes." Richard Avery, Henry W. Brooks, and Nicholas Baggs are named as corporators; and T. M. Kones, Wm. T. Wiley, Edward P. Cone, and J. W. Bartlett as directors. Perhaps, so modest are they about their future operations, they are trying to "hide their light under a Baggs."

Cheaper Gas for Dayton Ohio.—Acting under authorization of his Board of Directors (action having been taken at a meeting of the Board held April 28), Mr. Geo. M. Smart, Secretary of the Dayton Gas Light Company, has given notice that from and after July 1, 1885, the gross price of gas will be reduced to $1.80 per thousand cubic feet. A discount of 10 cents per thousand is to be allowed to consumers settling their accounts on or before the fifth day of month in which the statements are presented. The price at Dayton is based on an "all round" schedule, and no discrimination is made between gas employed for illumination and that used for culinary or power purposes. It might possibly pay the Dayton folks to make trial of the scheme (inaugurated with first day of May and referred to above) now being tried at Fostoria.

"Coming Down" Once More at Milwaukee, Wis.—In our last issue we promised to give particulars concerning the latest move in reducing selling rates for gas at Milwaukee, and we herewith redeem that pledge. Before proceeding with the same, however, we wish to thank Superintendent Ed. G. Cowdery for his courtesy to us in connection with the matter. It may be remembered that the Milwaukee Company's management, upon announcing the July, 1884, reduction, said to the consumers that it they (the latter) would only encourage the former by a free use of gas, future reductions in price would be cheerfully granted. The consumers responded in proper style, and now the gas men keep their promise; and, by the way, it is just a trifle curious to note the regard with which a gas man is held in out at Milwaukee—especially the gas men connected with the Milwaukee Company. [Not to exaggerate the matter one tittle, the average Milwaukee gas consumer is actually willing and anxious to treat the Milwaukee gas maker as though he were an honest business man, actually engaged in a reputable commercial enterprise. It may seem rather odd to mos to the fraternity; but nevertheless such is the state of affairs out there. To no other gas man will the

ludicrous side of this appear more strongly than to the one who operates in New York city, or her sleepy partner on the other side of the East River, recognizable to geographers as Brooklyn, but to the general world known either as the City of Churches, the dwelling-place of Mr. Beecher, or the cage of Mr. Talmage. In these cities the fair and equable policy maintained by the Milwaukee Gas Company toward its consumers would have no earthly effect. Gas at a dollar a thousand would be rated as an attempt at vile extortion just about one year after the time when it had been reduced (supposing a case) from $3; and the Sherwoods, Thurbers, Coffeys, Bottsfords, *et al.*, would be at one moment in tears at the sufferings of their fellow-consumers, while the succeeding division of the minute would be sufficient to alter these sorrowful wailings into wrathful and resonant outpourings against the rapacity and rascality of the purveyors of carburetted hydrogen. Perhaps by this time our readers are a trifle perplexed about the question as to what all this has got to do with the new gas prices at Milwaukee. Not a great deal, it is true; but we may be pardoned for the digression (and the explosion), being led thereto simply on account of remembering that if the gas maker lies on a bed of roses at Milwaukee, his brother at this end of the country has no option but to stretch his weary limbs upon a couch the upholstering of which is not sufficiently thick to restrain the thorns from coming through—speaking in both cases solely with reference to "public opinion;" and as for other matters connected with our city fraternity, it may be put upon record that they "are doing quite well."]

The Milwaukee Company's directors, on Wednesday, April 23d, after having made an inspection of the accounts, and canvassed together over the probable outlook, promulgated the following order: From and after July 1st, 1885, consumers' bills are to be made out on the basis of $1.80 per 1,000, and in consideration of prompt payment a discount of 40 cents will be allowed, making the net charge equal $1.40. On January 1st, 1882, the company reduced the price from $2.25 to $2; July 1st, 1883, to $1.80; July 1st, '84, to $1.60; and the one above announced becoming operative on July 1st, '85, $1.40. In this last statement only lowest net rate for prompt payment is given. The increasing demand for gas has rendered necessary the enlargement of what is known as the "Third Ward" plant, and the betterments thereto include the erection of a new holder, with cubic content of 400,000 cubic feet, new condenser and purifying apparatus calculated to pass one million cubic feet per diem, the latter machinery to be erected in buildings designed to admit of its future duplication. The estimated expense attendant upon this construction is placed at $140,000. The distribution system is to be overhauled and extended, $25,000 having been set apart for the completion of that work. It might be explained that the major portion of the latter sum is to be expended in the direction of replacing a certain mileage of small pipe with conduits of larger diameter. Take it all in all, Superintendent Cowdery will have a busy time of it this summer.

Trying to "Find Out" Where He "Comes In."—That "apostle of light and honesty," Mister W. W. Gibbs, is in a sort of quandary just now, as the Consolidated Gas Company, of Baltimore, Md., appears to be rather backward in paying up the cash in settlement of certain "delicate" negotiations which Gibbs, according to his claim, carried on between the Equitable and Consolidated managers some time ago. It is surmised the negotiations were those which resulted in the termination of the war of gas rates enjoyed by the Baltimore gas consumer; or, in other words, the "deal" by which the price of gas was increased from $1 to $1.70 per thousand in the Monumental City. Mister Gibbs asks for the modest sum of $50,000 as a recompense for his "delicate tactics." He entered suit for that "pretty penny" on the 11th day of May; and Mister Gibbs' hair, we imagine, will be very thin by the time he gets a judgment. It is only to be hoped that the Consolidated Company will urge a speedy trial of the case; and we opine that if it ever comes before a jury, Mister Gibbs will be about the "sickest man" of his day and time in this country. There was a somewhat similar case to this in Brooklyn some years ago, or when a certain gentleman connected at the time with the Citizens Gas Light Company, of that city, asked to be remunerated for certain services rendered in connection with a proposed famous (it seems as though a prefix had been omitted from the last word) "deal" in Brooklyn gas circles. The Brooklyn party, though, never had the temerity to ask a court of justice to assist him in "collecting" the "remuneration;" and he never got one cent of the sum asked for. The water gas gentry had better "chain Mister Gibbs up," as the hardness of his cheek appears to be extending rapidly in the direction of his "massive" organs of thought. It would be a pity if general induration should soon attack Mister Gibbs, or, at any rate, before he has had another chance at Washington.

Something from Pittsfield, Mass.—The annual meeting of stockholders of the Pittsfield Gas Light Company was held on Tuesday, May 5th, and the following board of directors was chosen for the ensuing year: Messrs. R. W. Adam, W. G. Backus, W. R. Plunkett, D. J. Dodge, and J. W. Hull. The directors organized by selecting R. W. Adam as President, and W. R. Plunkett as Treasurer. Mr. Hull is a new man in the directorate, and was chosen to succeed Mr. Edwin Clapp, the latter named gentleman having "gone over to the silent majority." The directors signalized their accession to office by making a reduced rate for gas, the terms of which come into effect on consumption dating from first of next October. The gross price was reduced from $3 to $2.50 per 1,000, discounts for prompt payment being the following:

A monthly consumption of	less than	1,000 cubic feet,	25 cents per M.
" "	between	1,000 and 50,000,	50 " "
" "	of over	50,000 cubic feet,	62½ " "

In 1864 the price charged for gas at Pittsfield was $5 per 1,000, and it should be understood that Pittsfield's population increase has by no means been commensurate with the steady decrease in gas rates. Still, the gas men there have kept on doing what they could towards improving their condition by pursuing honest business methods. Freight charges make gas coals dear in that locality, and the extremely low temperatures often experienced during the winter seasons are, of course, disadvantageous. Despite these disadvantages the Pittsfield folks have always managed to send out good gas, the report of State Gas Inspector showing the grand average of illuminating power for the year to have been 18.96 candles; and in face of every difficulty their business has steadily prospered. Two new benches of sixes were added to plant last year; an inclined railway, for conveying coal from storage sheds to retort house, was erected, and one or two minor betterments carried out, at the expense of several thousand dollars. The pretty city, nestling so near to the Berkshire hills, has no complaint to make about its gas purveyors.

Bangor (Me.) Turns on the Electric Light.—The electric light plant installed at Bangor through the instrumentality of the American Electric Lighting Company, of Boston, Mass., was put in operation on the evening of April 24. The capacity of the station is rated as equal to the maintenance of 114 arc lights. The Armington & Sims Engine Company (Providence, R. I.) furnished the engines. It is said the Edison Company now proposes to erect a plant for incandescence lighting at Bangor.

The Death Roll.—P. Loeblen, keeper of a public barroom at 189 East 117th street, New York city, was found dead in his bed at 10:30 P.M., on evening of April 28th. He had retired to take a "nap" (at about 6:30 P.M.), requesting that he be called at 10:30 P.M., so that he might relieve his assistant. When Mrs. Loeblen went to arouse him at the appointed time she made the discovery that her husband was a corpse. It is said that a gas pipe to the apartment had not been properly capped, hence the escape that caused Loeblen's death by asphyxiation. It should be remembered that water gas is now being supplied by the Consolidated Company to the Harlem district, and there have been two deaths in the space of a month that are traceable to gas inhalation.

Street Lighting Awards in New York City.—The New York city Gas Commission, on April 28, met and awarded the contracts for city's street lighting for fiscal year ending April 30, 1885. The Consolidated Company's portion was allotted at the rate of $17.50 per lamp, the Mutual Company getting an award at same figures. The Equitable Company gets all the lamps along its lines of mains at $12 per annum each. It is estimated that the latter corporation will light about 1,200 lamps, and the loss incurred on each, at the contract figure, certainly cannot be less than $4. It is a decided pity that the Equitable folks are not so situated that they might get the entire service to attend to. The Central Company is to light the 23d Ward lamps for $28 each; the Northern and Yonkers Companies to be paid $30 per lamp for lighting done in 24th Ward. The electric companies were authorized to continue their present lighting, and a grant of 56 additional lights was awarded them—the latter being located along Catherine, Chambers, Fulton, and Canal streets.

An Electric Lighting Company for the Harlem District, N. Y.—According to a certificate of incorporation filed May 2, the objects for which the Harlem Electric Illuminating Company is created are "to produce and use electricity for purposes of light, heat, and power, and to manufacture and sell apparatus to be employed in its production." The capital stock is $300,000. The incorporators are G. F. Smith, H. Marsh, and D. Carleton.

Naphtha for Enriching Coal Gas.

Cleveland Gas Light and Coke Company,
Cleveland, Ohio, March 18, 1885.

W. H. Doan, Esq., Cleveland, Ohio:

Dear Sir—We have used for a number of years your naphtha for enriching our coal gas. We find we get a whiter light and higher candle power gas than we otherwise would by using cannel coal; and we also avoid the annoyance of two qualities of coke. Yours truly,

—*Adv.* J. H. Morley, President.

THE AMERICAN GAS LIGHT JOURNAL

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SATURDAY, MAY 16, 1885.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 WALL ST., NEW YORK CITY.

MAY 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	96½	97
Central	440,000	50	60	70
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	124	126
" Bonds	1,000,000	—	107	110
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	113	—
Mutual	3,500,000	100	130	132
" Bonds	1,500,000	1000	104	107
Municipal, Bonds	750,000		—	—
Northern	125,000	50	50	—
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	127	129x
Citizens	1,200,000	20	83	85
" S. F. Bonds	320,000	1000	106	110
Fulton Municipal	3,000,000	100	148	150
" Bonds	300,000		104	108
Peoples	1,000,000	10	81	83
" Bonds	290,000	—	105	110
" "	250,000	—	90	95
Metropolitan	1,000,000	100	94	96
Nassau	1,000,000	25	123	126
" Ctfs	700,000	1000	92	94
Williamsburgh	1,000,000	50	134	137
" Bonds	1,000,000	—	110	110½
Richmond Co., S. I.	300,000	50	64	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	80	85
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	103	115
" " Bonds.	124,000	—	105	110
Chicago Gas Co., Ills	5,000,0000	25	128	132
Peoples G. L. & C. Co., Chicago, Ills			8	12
Cincinnati G. & C. Co.			180	182
Consolidated, Balt	6,000,000	100	54¾	55
" Bonds	3,600,000		107	107½
Central, S. F., Cal			—	58
Capital, Sacramento, Cal.			56	—
Hartford, Conn	750,000	25	123	129
Jersey City	750,000	20	145	—
Laclede, St. Louis, Mo.	1,600,000	100	100	105
Louisville, Ky	1,500,000	50	95	100
Montreal, Canada	2,000,000	100	181	182½
New Haven, Conn		25	166	170
Oakland, Cal			29	30
Peoples, Jersey City		—	45	—
" " Bonds			—	—

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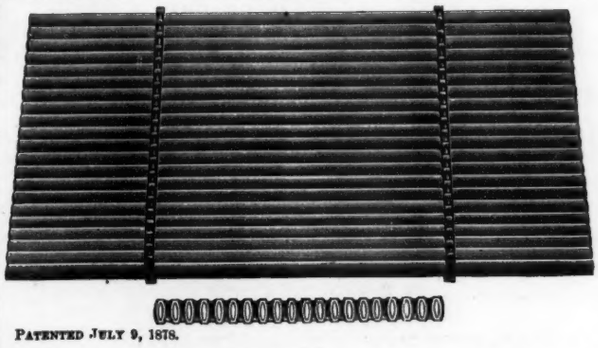

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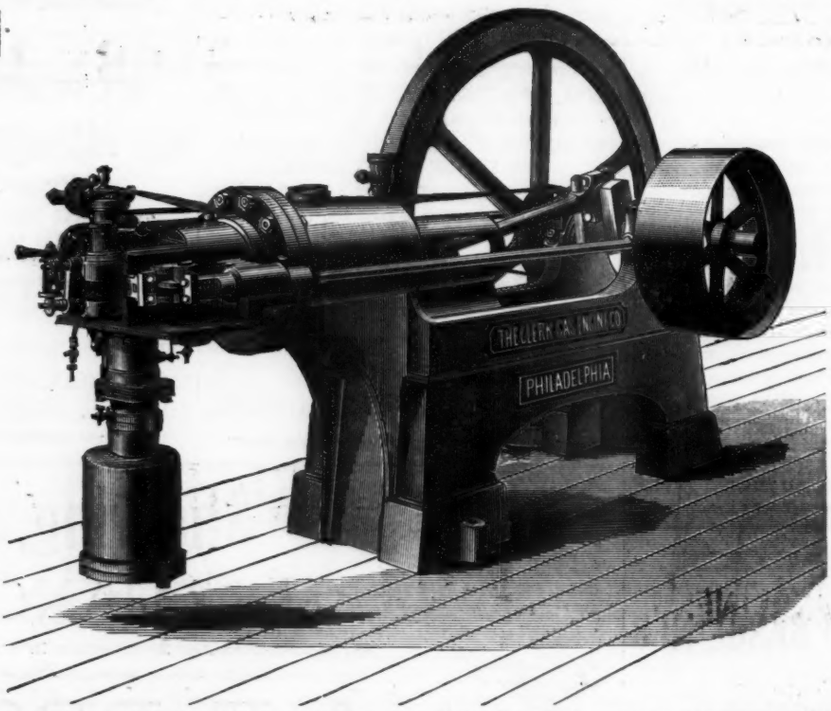

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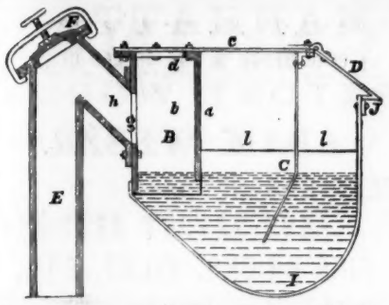

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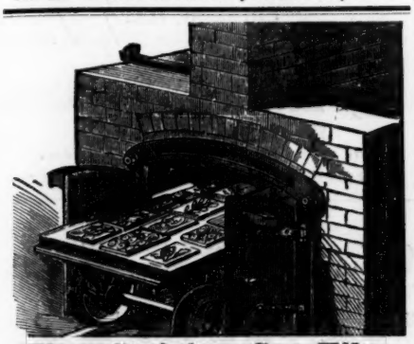

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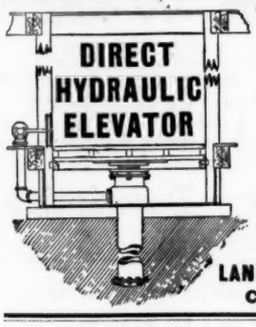

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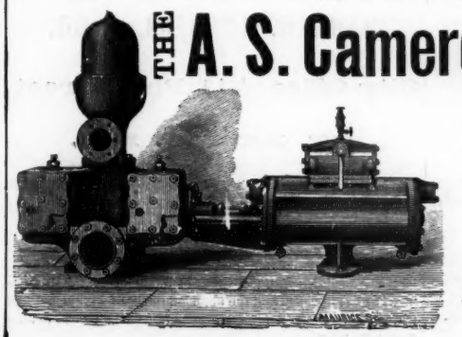

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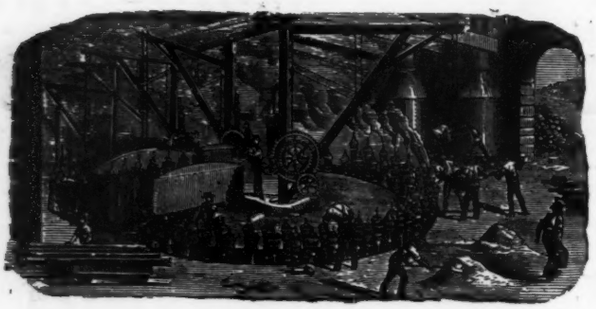

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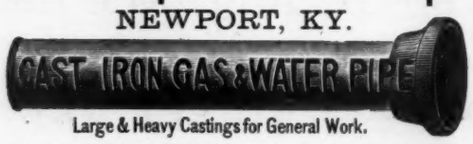

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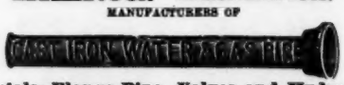

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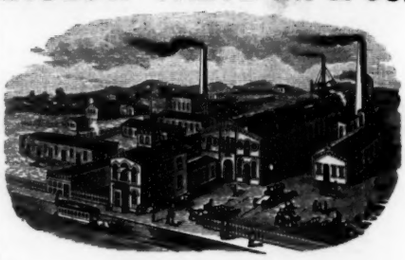

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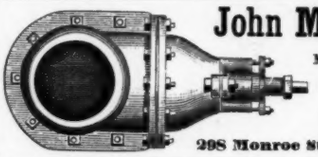

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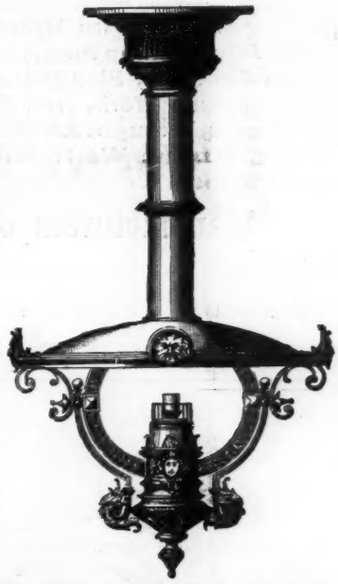

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1884	26,177,500	"
Total	235,937,500	cubic feet.

Total Number and Capacity per 24 Hours of "Standard" Washers Erected and in Course of Erection in the Several Countries

	Number.	Cubic Feet per Day.
Great Britain	151	157,070,000
Western Hemisphere	38	39,337,500
Australia	18	12,150,000
New Zealand	2	650,000
France	6	4,550,000
Belgium	8	5,420,000
Germany	16	8,200,000
Holland	4	4,160,000
Denmark	1	150,000
Russia	2	3,500,000
Spain	1	350,000
India	1	400,000
Total	248	235,937,500

THE CONTINUED POPULARITY

Of these Machines

Will be recognized from the following extracts from letters from representatives of some of the companies having them in use:

ALLEGHENY GAS WORKS,
ALLEGHENY, PA., Dec. 12, '84.

MR. GEO. SHEPARD PAGE, New York:

Dear Sir—The "Standard" Washer Scrubber is giving us entire satisfaction. At present we are using one gallon water per thousand cubic feet, and the liquor as it leaves the Scrubber is 8 degrees (16 oz.) by Twaddle's hydrometer.

Yours respectfully,
ROBERT YOUNG, Eng'r.

"Standard" Washers Ordered During the Current Year.

	Cu. Ft. per Day
Anneberg Gas Co	200,000
Bombay Gas Co	400,000
Brussels Co	1,250,000
Chemnitz Gas Co	1,000,000
CITIZENS GAS CO., BUFFALO	750,000
Coke Works in Zabre, Ober-Schlesien	1,500,000
Cokerei der Friedenshutte, Upper Silesia	700,000
Dumfries Corporation	250,000
Dunedin Gas Co., New Zealand	400,000
King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
LOUISVILLE GAS CO	1,500,00
Numea Gas Co	100,00
PITTSBURGH GAS CO	1,500,
PORTLAND GAS CO., Oregon	562,5
SAN FRANCISCO GAS CO	4,000,000
Sheepbridge	40,000
ST. LOUIS GAS CO	2,000,000
Sydney Gas Co	2,500,000
WASHINGTON, D. C. GAS CO	2,000,000
Whitchurch Gas Co	175,000
Total	26,177,500

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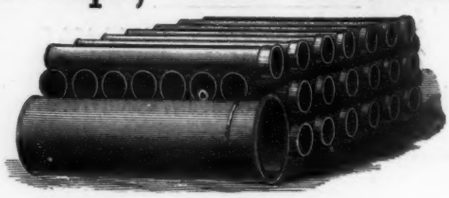

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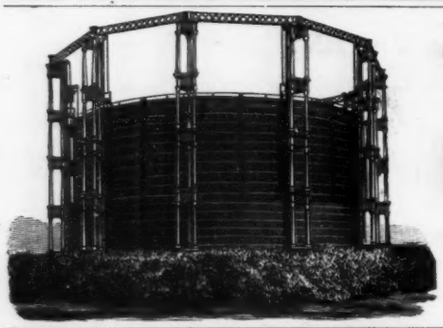

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Built, 1884:

Altoona, Pa	Capacity,	160,000	cubic feet.
Pittsburgh, Pa	"	250,000	"
" "	"	230,000	"
Bellaire, Ohio	"	50,000	"
Youngstown, Ohio	"	60,000	"
Canton, "	"	60,000	"
Akron, "	"	80,000	"
Xenia, "	"	10,000	"
Adrian, Mich	"	65,000	"
Ypsilanti, Mich	"	25,000	"
Muskegon, "	"	70,000	"
South Bend, Ind	"	70,000	"
Anderson, "	"	20,000	"
Plainfield, "	"	10,000	"
Springfield, Illinois	"	100,000	"
Evanston, "	"	50,000	"
Freeport, "	"	35,000	"
Elgin, "	"	60,000	"
Sheboygan Wis	"	20,000	"
Key West Fla	"	10,000	"

Plans and estimates furnished for the erection of new and the rebuilding of old works. Address

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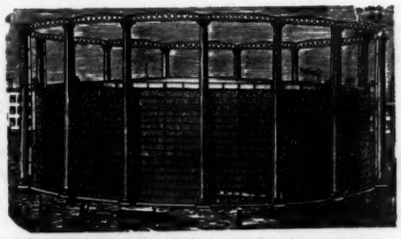

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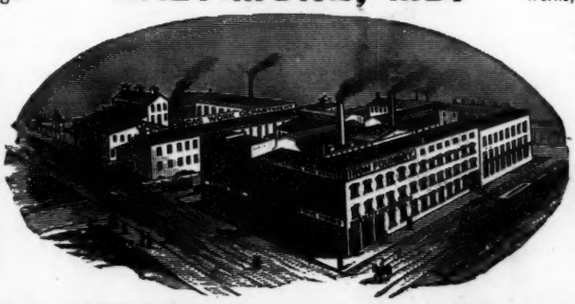

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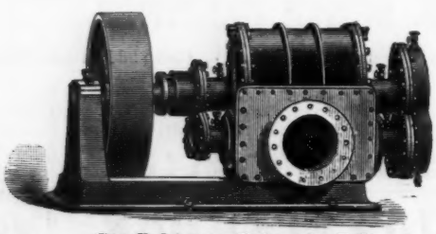

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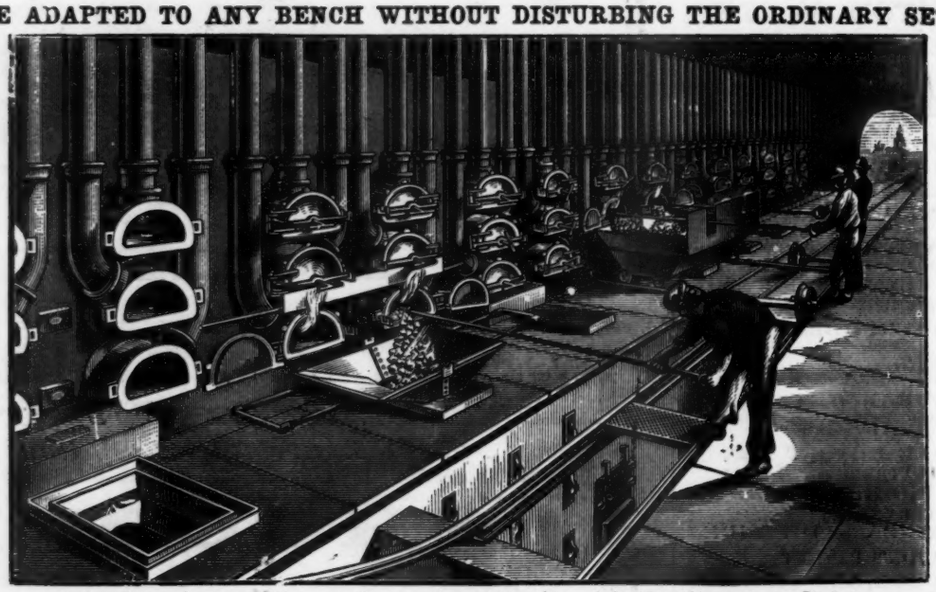

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Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President

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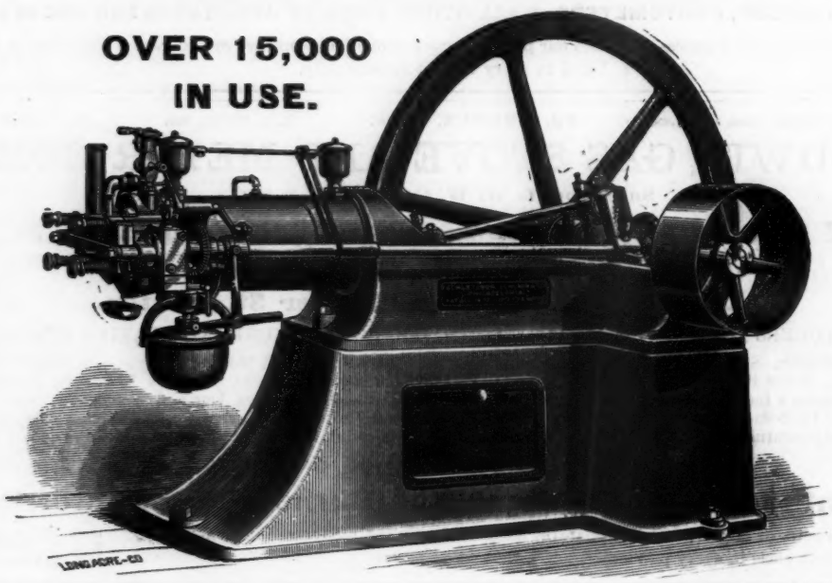

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